

164-29203

*Technical Memorandum No. 33-170*

*JPL Tracking Data Editing Program  
for the IBM 7094*

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*C. Coltharp*



JET PROPULSION LABORATORY  
CALIFORNIA INSTITUTE OF TECHNOLOGY  
PASADENA, CALIFORNIA

August 1, 1964

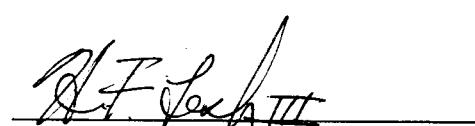
SQT-37126-R

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**August 1, 1964**

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Prepared Under Contract No. NAS 7-100  
National Aeronautics & Space Administration

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## ABSTRACT

The function of the Tracking Data Editing Program is to develop formats for new tracking data so it can be handled easily by the Orbit Determination Program. Tracking data are entered in a wide variety of formats and data types on punched cards, or card images, on magnetic tape. Flexible control cards allow the user to specify formats and data types, to correct wrong numbers, and to read in a large number of constants used in preliminary reduction of tracking data. These constants include weights, frequencies, smoothing criteria, angle corrections, and transmitter times. Control cards are also used to help the program maintain a master data file, and to select particular sets of data from the master file for the Orbit Determination Program.

The program described here was designed for *Mariner A* and *Ranger* Block III. Considerable revision is to be undertaken for later missions, although much of this document will be applicable.

## I. INTRODUCTION

The Tracking Data Editing Program (TDEP) is a preprocessor for all teletype tracking data input for the Orbit Determination Program (ODP). Design considerations made it desirable that the TDEP be written as a program physically distinct from the ODP. The procedures that were programmed to provide adequate flexibility and reliability for the successful performance of the data editing function now are part of a five-link (core load) program.

Any number of tracking cards from a maximum of ten tracking stations (DSIF and AMR) can be read on-line or from tape at one time; station redefinitions and format changes can be processed during program operation. Incorrect and suspicious data are rejected via format, field, and data smoothness tests. New data are merged onto a mission-tracking history magnetic tape (called the "master tape"), and a data set is selected via control cards for further processing and written on a tape to be used as input to the ODP. The TDEP control cards afford a high degree of flexibility, both in the selection of data to be stored on the master tape and in those to be included on the ODP input tape.

Program stops in all links are accompanied by explanatory on-line comments. In the operational mode, it will be necessary to depress sense switch 6 and push "START" before the comment is printed. For a more detailed explanation of formats, input, output, and core, refer to Appendices A-G. For additional explanation of angle and doppler processing, refer to Appendices H-J.

## II. THE TRACKING MESSAGE

Tracking data comes from two primary sources: doppler and angle data from DSIF stations, and range and angle data from AMR stations. The tracking messages are received via teletype in near real-time and are converted to punched cards for input to the TDEP.

### A. DSIF Message Formats

The assignments of card columns for data types are given below for MTS and all other DSIF stations:

#### Station 59 (Mobile Tracking Station)

Column	Information
1-3	Blank
4-5	Station ID
6	Blank
7-8	Spacecraft ID (DC4)
9	Blank
10	DC2
11	DC3
12	Blank
13-18	Time (HHMMSS)
19	Blank
20-25	Azimuth *10 <sup>3</sup>
26	Blank
27-32	Elevation *10 <sup>3</sup>
33	Blank
34-41	Doppler count
42	Blank
43-45	Day of year

<b>Column</b>	<b>Information</b>
<b>All DSIF stations (except MTS)</b>	
1-3	Blank
4-5	Station ID
6	Blank
7-8	Spacecraft ID (DC4)
9	Blank
10	DC1
11	DC2
12	DC3
13	DC5
14	Blank
15-20	Time (HHMMSS)
21	Blank
22-27	Hour angle * 10 <sup>3</sup>
28	Blank
29-34	Declination * 10 <sup>3</sup>
35	Blank
36-45	Doppler count
46	Blank
47-49	Day of year

Each data type has its own format. All are numeric, and no blanks are allowed within any data field.

### 1. Data Condition Codes

The data condition codes accompanying each tracking data sample are in five fields. They indicate the quality of the data on the card. The first field (DC1) can assume any value in the closed interval (0, 8). The second and third field (DC2, DC3) can assume any value in the closed interval (0, 7). The fourth field (DC4) can assume any value in the closed interval (0, 99). The fifth field can be 0, 1, or 2.

a. *The first digit.* DC1 indicates whether cycle count or doppler data are present and, in the case of cycle count, the averaging time. The following code is established for the first digit:

If DC1 is:                                  Then:

0    The doppler data averaged over 1 sec are present.

**If DC1 is:****Then:**

- 1      The destructive cycle count, counted over 5 sec, is present.
- 2      The destructive cycle count, counted over 10 sec, is present.
- 3      The destructive cycle count, counted over 20 sec, is present.
- 4      The destructive cycle count, counted over 30 sec, is present.
- 5      The destructive cycle count, counted over 40 sec, is present.
- 6      The destructive cycle count, counted over 50 sec, is present.
- 7      The destructive cycle count, counted over 60 sec, is present.
- 8      The nondestructive cycle count is present.

*b. The second digit.* DC2 indicates the condition of the accompanying data sample. The following code is established for the second digit:

**If DC2 is:****Then:**

- 0      Good data, in RF lock, in auto track
- 1      Good data, in RF lock, not in auto track
- 2      Good data, not in RF lock, in auto track
- 3      Good data, not in RF lock, not in auto track
- 4      Bad data, in RF lock, in auto track
- 5      Bad data, in RF lock, not in auto track
- 6      Bad data, not in RF lock, in auto track
- 7      Bad data, not in RF lock, not in auto track

*c. The third digit.* DC3 conveys the type of cycle count or doppler data being recorded. The following code is established for the third digit:

**If DC3 is:****Then the type of doppler or cycle count data being recorded is:**

- 0      Two-way
- 1      One-way
- 2      Pseudo two-way (three-way)
- 3      CC3 (coherent three-way)
- 4-7     Equivalent to 0-3 except alternate counter is being used

*d. The fourth digit.* DC4 is a two-digit number used to identify the spacecraft from which the message was derived.

*e. The fifth digit.* DC5 is a one-digit number used to define the status of the atomic frequency standard at the station.

**If DC5 is:**                                   **Then:**

- |   |   |
|---|---|
| 0 | Atomic frequency standard is in lock.     |
| 1 | Atomic frequency standard is out of lock. |
| 2 | DC5 is not applicable.                    |

Since DC1 and DC5 are missing from the MTS data message, it is necessary to input via control cards any change from the assumed DC1 = 0, DC5 = 0 status of these codes.

## 2. Angles

The angles are in units of degrees \*10<sup>3</sup>.

## 3. Doppler

The doppler is in units of counts per count interval or, in the case of non-destructive cycle count, accumulated counts since the doppler counter was reset.

## 4. Time

Time is in GMT in hours, minutes, seconds, day of year.

## 5. Station ID

The station ID is a 2-digit number. Stations have been assigned the following identification numbers:

- 59 Mobile Tracking Station (MTS)
- 11 Goldstone (JETGLD-2)
- 12 Goldstone (JETGLD-3)
- 41 Woomera (OOMJET)
- 51 South Africa (JOBURG)

## B. AMR Message Formats

The AMR tracking formats as received by the TDEP are:

Column	Information
1-3	Blank
4	Data type

Column	Information
5-6	Station ID
7	Not used
8	DC2 (on track code)
9-14	Time (HHMMSS)
15-21	Azimuth (in octal)
22-28	Elevation (in octal)
29-37	Range (in octal)

Explanation of the separate fields is given below:

1. Data type

2 = real time

3 = simulated data

7 = last sample

2. DC2

0 = off track (bad data)

2 = on track (good data)

3. Time

GMT in hours, minutes, seconds. Since no day is specified in the message, this information must be input to the TDEP by a control card.

4. Angles

The angles are in octal, in units of circles  $*2^{20}$ . For example,  $2000000_8$  = half a circle, or 180 deg.

5. Range

The range is in octal, in units of 1 yd or 1.953125 yd.

### III. INPUT TO THE PROGRAM (LINK 1)

Link 1 of the TDEP comprises the initiation and input portions of the program. Control cards are translated and proper action taken. Those control cards that generate control records are translated and stored either on the master data tape or on a scratch tape for use in Links 3 and 4. Data cards are scanned for format and packed into logical records in core for master tape updating in Link 2.

#### Program Outline and Flow

An arrow " → " should be read as "go to step number".

1. Initialize common and indicators (see Appendix for nominal values and settings).
2. Read one card on-line. If card read → 4. If EOF → 3.
3. Notify user of options. If off-line → 5; if on-line → 2.
4. Read cards on-line until EOF → 4b; or 100 cards read → 4a.
  - 4a. Make BCD list tape on tape A and set indicator for list tape A → 4.
  - 4b. If list tape made, add to list tape A → 5; if on-line → 6.
5. Read 100 cards into core buffer → 5a; or until EOF. → 6.
  - 5a. Set indicator to return to 5 → 6.
6. Examine next card image for card type as follows:  
(If EOF, → 9).

Columns 1-6	Description
CHANGE	General control card to modify program control and add to transmitter tables → 6b (or 6a if error).
FORMAT	Alter station format table to accept non-nominal format. Check for legal format. If legal → 6. If illegal → 6a.
ASSIGN	Alter station data type assignment to accept assignments → 6 (or 6a if error).
SAMPLE	Control record for sample table. Write on tape B → 6 (or 6a if error).
COUNT	Control record for count table. Write on tape B → 6 (or 6a if error).
REMOVE	Erase specified control records (frequencies, transmitters, pass identifications, weights) from master tape control file → 6 (or 6a if error).

<b>Columns 1-6</b>	<b>Description</b>
REJECT, ACCEPT	Set reject table to reject specified data type → 6 (or 6a if error).
IGNORE	Control record for link 3 to ignore specified data type or class. Write on tape B → 6 (or 6a if error).
FEARY	Control record for link 3 to alter angle correction coefficients. Write on tape B → 6 (or 6a if error).

(Any other characters beginning in Column 1) → 6d.

#### **Column K**

If numeric, read as data card. Column K is first column of station ID → 7.  
If blank → 6c.

- 6a. Notify user of error in control card and give options (depress sign key to reject, read another card to replace). If another card is read, reset card number → 6; otherwise → 6.
- 6b. Perform required changes to program → 6.
- 6c. Reject all other cards as unrecognizable, print off-line → 6.
- 6d. Notify user of unrecognizable control cards (option as in 6a).
- 7. Scan data card image against format to detect errors. Conversion characters allowed and restrictions are:

<b>BCD</b>	<b>Hollerith</b>	<b>Definition</b>
31	I	All columns in field must be numeric (0-9); leading blanks permitted. Stored in address portion of word specified by ASSIGN statement.
26	F	All columns in field must be numeric (0-9) or decimal point (.); leading blanks permitted.
46	O	All columns in field must be numeric (0-7) octal only; leading blanks permitted.
41	J	Same as I except no leading blanks are permitted.
27	G	Same as F except no leading blanks are permitted.
50	Q	Same as O except no leading blanks are permitted.
67	X	Field ignored, no errors possible, image will be blanked out.
22	B	Field must be blank.
74	(	Begins format or repeated field.
34	)	Ends format or repeated field.
33	.	Used in F and G conversion.
73	,	Continue to next conversion.

<b>BCD</b>	<b>Hollerith</b>	<b>Definition</b>
60	blank	Skip to next character.
42	K	Same as I except full word.
43	L	Same as J except full word.

- 7a. All bad cards are rejected and listed. The following comments are possible:

BLANK IN DECIMAL FIELD

BLANK IN OCTAL FIELD

CHARACTER IN BLANK FIELD

CHARACTER NOT OCTAL

CHARACTER NOT DECIMAL

If format is in error → 6; otherwise → 7b.

- 7b. Convert image according to FORMAT statement and store converted values according to ASSIGN statement. Fields may be assigned to any of the input data types:

RCID (station ID)  
DC1 (data condition code No. 1)  
DC2 (data condition code No. 2)  
DC3 (data condition code No. 3)  
DC4 (spacecraft ID)  
DC5 (data condition code No. 5)  
DP (doppler)  
DAY (day of year)  
HR (hours)  
MIN (minutes)  
SEC (seconds)  
EL (elevation angle)  
AZ (azimuth angle)  
DEC (declination)  
HA (hour angle)  
R (range)  
RDOT (range rate)

In addition, the following special conversions may be performed:

- AMRRNG (converts fixed point range in yards to floating point range in kilometers)
- GUAR (converts fixed point range in units of 1.953125 yd to floating point range in kilometers)
- NAUT (converts floating point range in nautical miles to floating point range in kilometers)
- YD (converts floating point range in yards to floating point range in kilometers)
- FT (converts floating point range in feet to floating point range in kilometers)
- MT (converts floating point range in meters to floating point range in kilometers)
- RA (converts floating point angle in radians to floating point angle in degrees and fraction of a degree)
- DM (converts floating point angle in degrees and minutes to floating point angle in degrees and fraction of a degree)
- ASCA (converts fixed point angle in units of  $2^{17}$  mils to floating point angle in units of degrees and fraction of a degree)
- AMRANG (converts fixed point angle in units of  $2^{19}$  mils to floating point angle in degrees and fraction of a degree)
- FRAC (converts floating point angle in mils to floating point angle in degrees and fraction of a degree)
- VENUS (corrects for radius of Venus by adding 6100 km to fixed point range and floating the result)
- ASCR (assuming that DC5 has a value of  $n$ , adds  $n*2,304,000$  yd to fixed point range in yards and converts to floating point kilometers)

If a desired conversion is not available in the above list and it can be accomplished by a floating point multiplication, the conversion factor may be read directly on the ASSIGN card; thus,

R(MT) or

R(.001)

will perform the same conversion when R has been converted to floating point by a FORMAT card.

When the image has been converted and stored → 8.

8. Carry out any input resets or rejects → 8a.

8a. Reject bad data by use of the following data type ranges:<sup>\*</sup>

$0 \leq DC1 \leq 8$	$0 \leq MIN \leq 59$	$DP (\text{Doppler} \geq 10000 \text{ cps})$
$DC2 = 0, 1, 4, 5$	$0 \leq SEC \leq 59.999999$	$R \geq 0$
$0 \leq DC3 \leq 7$	$0 \leq AZ < 360^\circ$	
$0 \leq DC4 \leq 99$	$0 \leq HA < 360^\circ$	
$DC5 = 0, 1$	$0 \leq EL < 90^\circ$	
$0 \leq HR \leq 23$	$0 \leq DEC < 360^\circ$	

If the message passes all the data range tests, it is packed as a logical record into GTBLE (see Appendix for GTBLE format) → 8c.

8c. Update 3 registers for each station for good data

1. number of data points
2. minimum time
3. maximum time

8d. Return to 6 until GTBLE is full (2000 card images). If GTBLE is full, set indicator to provide later return (at the end of Link 2) to process more data → 10.

9. Write nominal control records on back of master tape (tape C) and position master tape to beginning of control file → 10.

10. Go to Link 2.

---

\*NOTE: Only data types present in the ASSIGN statement are checked for data range.

#### IV. UPDATING THE MASTER TAPE C (LINK 2)

Link 2 completes the processing of the input data. Certain smoothing operations are performed (second difference tests), and the data are checked for time consistency. The new data are added to the master tape, and the master-tape data summaries are updated.

##### Program Outline and Flow

1. Initialize registers for floating point trapping → 2.
2. Print summaries of accepted and rejected input data → 3.
3. Rewind tape A → 4.

### Program Outline and Flow (Cont'd)

4. List accepted data (UNPACK) unless requested otherwise. If some input data exist → 5. If no input data exist → 21.
5. Rewind tape C → 6.
6. Position tape C to beginning of first station file for which new input data exist → 7.
7. Reject data out of time sort unless otherwise requested and adjust input data totals → 8.
8. Sort good data table (GTBLE) into form of time sort by station → 9.
9. Perform second difference tests on angles and doppler (see Appendix H for mathematical description) → 10.
10. List accepted data (UNPACK) unless requested otherwise. Adjust totals for data rejected → 11.
11. Initialize MERGE to first station with new input data → 12.
12. Test next station for new input data → 14. If no new input data for station → 13. If no more stations → 15.
13. Copy station file intact from tape C to tape A → 12.
14. Merge tape C and input data for station onto tape A. If any times are duplicated:
  - A. If the records are identical, reject input record.
  - B. If the records are not identical, reject both records. Print notification of duplicated time point → 12.
15. Copy control record file (tape C is positioned properly after last station merge) onto back of tape A → 16.
16. Rewind tape C and tape A → 17.
17. Position tape C to first station which was merged → 18.
18. Copy tape A onto tape C. Backspace tape A to beginning of last file (control record file). Rewind tape C.
19. Rewrite first tape C file using updated master file summaries and rewind tape C → 20.
20. If no more input data remain → Link 3. If input data remain, clear storage areas in core → Link 1.
21. Copy control record file from tape C onto tape A. Rewind tape C and tape A → 20.

## V. THE INTERMEDIATE TAPE B (LINK 3)

As a mission progresses, the master tape will normally have a great deal more data than will be used in updating the ODP input tape. Because of this, and because certain functions such as doppler compression and angle corrections are performed which alter the data configuration, an intermediate tape is made in Link 3. This tape contains only those data points which will be used in Link 4 to update the ODP input tape. To determine which points will be put on the intermediate tape, further validity and "goodness" tests are performed; IGNORE control records are checked for IGNORE requests; and SAMPLE and COUNT control records are interpreted for continuous count doppler compression. The intermediate tape is in the same form as the master tape files, except that the first and last files of the master file are not present (Appendix A). Thus a tape is made consisting of ten sequential station files, each in time sort. The intermediate tape data summaries are transmitted to Link 4 in core storage. Since the intermediate tape is remade every time the TDEP is run, a permanent tape record of the station data summaries is not required.

In the event that the TDEP has been run only to update the master tape and an ODP tape is not required on that run, use of the card

### CHANGE NO ODP TAPE

may be made. The TDEP will then skip Link 3 and Link 4, and the program will operate at the end of Link 4 in the normal fashion (see Appendix G for action of the sense switches).

Aside from the use of Link 1 for reading and translating control cards and Link 2 for certain positioning functions, Link 3 and Link 4 run independently of Link 1 and Link 2. The ODP tape updating function can be performed easily, even though no new data points are added to the master tape.

### Program Outline and Flow

1. Rewind tape B (which can contain IGNORE, SAMPLE, COUNT, FEARY control records) → 2.
2. Initialize registers for floating point trapping → 3.
3. If an ODP input tape has been requested → 4; otherwise → Link 4.
4. If SS5 is down rewind tape D (ODP input tape) → 6. If SS5 is up → 5.
5. If tape D is positioned properly for update, take epoch off tape D and store in core storage → 6. If tape D is not positioned properly for update, print comment on-line → 5a.
  - 5a. 1. Rewind tape D → 6.
  2. Position tape D for update procedure → 5.
6. Initialize internal core buffers—sort IGNORE, COUNT, SAMPLE, FEARY control records into core buffers from tape B, and sort TRANSMITTER, FREQUENCY, WEIGHT, and PASSID into core buffers from tape A.

Discard any control records with times before epoch (epoch read from ODP input tape, EPOCH control card, or injection epoch, whichever is latest) → 7.

NOTE: The internal core buffers can hold only 300 control records of each type, although any number can be accommodated on the master tape; therefore, any run requiring more than the control record limit must be broken up into smaller runs by successive updates of tape D.

7. Read master tape station data summaries into core registers → 8.
8. Initialize station register to station 1 → 8a.
  - 8a. Set counters to begin processing new station:
    1. Clear GTBLE area.
    2. If this is the first data set processed for this station, clear rejected data counts → 9. If this is a continuation of processing for this station → 9.
  9. Read 100 data records from master tape into core buffer (GUS). If no more data for station → 16; otherwise → 10.

NOTE: The operations that follow are preformed on 100 data points at a time.

10. Reject any data before epoch time and adjust rejection totals. If no data left → 9; otherwise → 11.
11. Reject manual (DSIF) or out-of-lock (AMR) data, and adjust counts. If no data left → 9; otherwise → 12.
12. Reject data in the range of IGNORE control records and adjust counts. If no data left → 9; otherwise → 13.
13. Reject doppler data when DC3 does not correspond to TRANSMITTER configuration. Print out any points rejected for transmitter errors. Adjust rejection counts. If no data left → 9; otherwise → 14.
14. Reject angle pairs resulting from observations below minimum elevation angle restraints (see Appendix I). Adjust rejection counts. If no data left → 9; otherwise → 15.
15. Perform angle correction operation on appropriate HA-DEC stations (see Appendix I). Print uncorrected and corrected angles and increments → 16.
16. Move data block from GUS (100 point buffer) to GOOSE (1000 point buffer). If GOOSE is full → 17. If no new data for station exists → 18; otherwise → 9.
17. Set initialization routine not to clear rejection counts → 18.
18. Compress continuous count doppler in GOOSE (see Appendix J) → 19.
19. If SS4 is up, delete angles internal to the compression interval. Otherwise, average angles to center of doppler compression interval → 20.
20. Subtract one-half count time from all continuous count doppler → 21.

21. Subtract one-half count time from all destructive end-count doppler. Split each record containing destructive count doppler and angles, one containing only the angles at the original time, the other containing doppler at the adjusted time. For continuous count doppler, if SS4 is up, split each record containing doppler and angles into two records, one containing only the angles with half the count time *added* to the time in the record (original time), the other containing doppler at the time in the record (already adjusted in 20). → 22.
22. Write the data, 100 records at a time, onto tape A. If more data remain for the current station → 8a; otherwise → 23.
23. Increase station counter by 1; if any stations remain to be processed → 8a. If no stations remain to be processed → 24.
24. Rewind tape B and tape C (tape C is not used in Link 4) → Link 4.

## VI. UPDATING THE ODP INPUT TAPE D (LINK 4)

In Link 4, the intermediate tape is used to update (or remake) the ODP input tape. Since tape B is in time sort by station, the data from the tape must be merged into a single stream in strict time sort (required by the ODP). In addition, certain control records (SAMPLE, FREQUENCY, WEIGHT, AND PASSID) are referenced, and data are added to the ODP input tape (see Appendix C for tape D format). The merging procedure is partially asynchronous, and its speed is limited only by the necessity of searching tape B for new data.

There are ten sort buffers set up in core; these buffers are divided up among stations with data. Thus, if there are five stations with data, each station has two buffers assigned. If there are any buffers left over, they are allocated beginning with the first station; thus with three stations, the first gets four buffers and the other two get three each. A list (sort list) is kept in core of the addresses of the next time point for each station (pointers). When a buffer is emptied (i.e., all data from it are sent to the ODP input tape), a message is generated and stacked into another list (request list). The subroutine which reads records from the intermediate tape is entered periodically, and any requests are processed. Thus, the merge can continue until all buffers for a particular station are emptied. Only then must processing be delayed.

When the next point in time sequence has been determined, a number of additional parameters are obtained from the appropriate control records and packed into a logical record in a format acceptable to the ODP input tape. This record is then added to a buffer in core; when the buffer is full, it is written on tape D. As soon as the buffer fills, the logical records are written in a second buffer, so that no time will be lost waiting for the buffer to be written. When the second buffer fills, the next points are written in the first buffer, and so on.

When the ODP input tape is complete, the sense switches are used to determine the next action for the TDEP (see Appendix G for sense switch options).

### Program Outline and Flow

1. Initialize registers for floating point trapping → 2.
2. If NO ODP tape request → 21; otherwise → 3.
3. Initialize request list by allocating buffers to stations with data → 4.
4. Fill core buffers from tape B. Record number of records read from each station → 5.
5. Initialize and sort the "sort list" → 6.
6. Find the next time point and move the record to working storage. If this results in emptying a buffer, try to read another record from tape B → 8. If no more input data exist, set flag → 7.
7. Adjust and re-sort the sort list, bringing in a pointer to the next point from the current station. Try to read another record from tape B → 8. If no more input data exist, set flag → 8.
8. Obtain PASSID for current point → 9.
9. Obtain SAMPLE time for current point → 10.
10. Obtain FREQUENCY for current transmitter → 11.
11. Pack into core buffer all words of record which are not data type dependent (see Appendix C) → 12.
12. Obtain WEIGHT code for first data type → 13.
13. Pack next two words of record with data type and WEIGHT code words → 14.
14. Continue from 12 until all data types in record have been processed. Then → 14a.
  - 14a. If no more input data exist → 16; otherwise → 15.
  15. If output buffer is not full → 7. If output buffer is full → 16.
  16. Convert time from seconds past injection to seconds past 1950.0. Update totals of data types added (by station) to tape D → 17.
  17. Initialize other output buffer for next point. Write current output buffer on tape D → 18.
  18. If no more input data exist → 19; otherwise → 7.
  19. Write an end-of-file on tape D. Rewind tape E → 20.

**Program Outline and Flow (Cont'd)**

20. Print summary of data types added to the ODP Input Tape (tape D)  
→ 21.
21. If SS3 is down → 22; otherwise call ODP from program tape.
22. Halt and give instructions.
  - a. Depress sign key to call ODP → 23.
  - b. Push start to re-start TDEP → Link 1.
23. If SS1 is down call ODP from tape B6. Otherwise call ODP from tape A9.

## APPENDIX A

### Master Tape and GTBLE in Core

The master tape is referred to internally as tape C\*.

The tape contains 12 files: file 1 is the master tape identifier; files 2–11 provide a file for each station; file 12 is for TRANSMITTER, PASSID, WEIGHT, and FREQUENCY control records.

<b>File</b>	<b>Record</b>	<b>No. words</b>	<b>Description</b>
1	1	2	Master tape identifier: 125252525252 <sub>s</sub> , 252525252525 <sub>s</sub>
	2	8	(DP) Launch GMT, launch time (seconds past 1950.0), maximum and minimum times on tape
	3	5*10	5 words each for stations 1–10
		1	Number of data points for station (full word integer)
		2, 3	Maximum time for station (DP)
		4, 5	Minimum time for station (DP)
2	K	≤100*9	Each physical record contains maximum of 100 data points (logical records) for station 1 in double precision time sort.
3			
.			
.			
11			
12	K	≤3*300*4	Contains TRANSMITTER, PASSID, WEIGHT CODE, and FREQUENCY INFORMATION in 3 word records.

---

\*The intermediate tape, tape B, is written in Link 3 for use in Link 4. Its format is identical to the master tape format for the station files. The first and last master tape files do not appear on the intermediate tape.

## I. MASTER TAPE DATA FORMATS

Good data logical record format (GTBLE in core) A = Address, T = Tag, D = Decrement, P = Prefix, S = Sign:

<b>Word</b>	<b>Contents</b>	<b>Form</b>
0, 1	DP seconds past injection	floating point
2	A = station, T = counter number, D = 0, P = DC3 (bits S, 1-2)	fixed point
2	S = $\begin{matrix} +:AZ, EL \\ -:HA, DEC \end{matrix}$ ; bit 1 = manual data; bit 2 = bad angles; bits [3-6 = DC1] Bits 7-9 = DC2, bits 10-14 = HR, bits 15-20 = MIN, bits 21-26 = SEC, bits 27-35 = DAY	fixed point
4	EL (DEC)	floating point
5	AZ (HA)	floating point
6	Divided doppler value or R	floating point
7	If positive, raw doppler value  If negative, RANGE	fixed point
8	D = card number, A = TAU, P (bits S-3) = DC4, T = DC5	floating point

## II. MASTER TAPE CONTROL RECORD FORMAT

### A. Weight Code Control Record

<b>Word</b>		
0	Prefix (S, 1-2)	= 4
	Bits 3-20	Weight code
	Bits	Data type
21		Range (R)
22		Range rate (RRATE)
23		Elevation (EL)
24		Azimuth (AZ)
25		Declination (DEC)

**Word (Cont'd)**

26	Hour angle ( HA )	
27	One-way doppler ( C1 )	
28	Two-way doppler ( CC3 or C2 )	
29	Three-way doppler ( C3 )	
30	Differenced one-way doppler ( D1 )	
31	Differenced coherent three-way doppler ( DC3 )	
Bits 32-35	Receiver ID	
1	Start time ( Seconds past injection )	floating point
2	Stop time ( Seconds past injection )	floating point

**B. Transmitter Control Records****Word**

0	Transmitter number = D, A = 0	fixed point
	Beacon on D = 0, A = 1	
	All transmitters off D = 0, A = 0	
	( Transmitters are assumed off unless on; only one transmitter can be on at a time. )	
1, 2	DP transmitter on time	floating point

**C. PASSID Control Record****Word**

0	P(S, 1, 2) = 2, D = PASSID, A = station	fixed point
1	Start time	floating point
2	Stop time	floating point

PASSID  $\leq$  32,000**D. Frequency Control Record****Word**

0	P(S, 1-2) = 1, bits 3-25 = frequency ( fixed point ), bits 26-35 = station	
1, 2	DP start time	

## APPENDIX B

Sense Indicator Usage<sup>†</sup>

link	Right	On	Off	Link	Left	On	Off
1	1	Input tape is list tape	*	1,3-5	1	Use Link 5 (old ODP tape format)	Use Link 4*
1	2	Input is on-line*		Input from tape			
1,2	4	A list tape is/was made		No tape made*	2	Accept data out of time sort	Reject*
1	10	Some data was read from tape		EOF (tape)*	1	4	*
2	20	Tape C (master) positioned for update	*		1	Some good data read	*
1	40	Some data was read on-line		EOF (car J reader)*	1,3	10	Some tape data read
1,2,3,4	100	S(1,2,3,4)	*		1,3,4,5	20	S(1,3)
1	200	Card identified as data	*		1,2,3,4	40	AMR data
1,2,3	400	CTBLE is empty (no good data)*		S(3)		100	S(1,2,3,4)
1,2	1000	Bad card (or illegal character)	*		2	200	—
1	1000	S(2)			400	Print good data (unpack)*	*
1,2	2000	Some input still to be read	*		1	1000	S(1)
1,2	4000	—			1	2000	S(1)
1	10000	Do not list bad cards			1	4000	Remove card read
3	20000	Use DC2 manual data		List bad cards*	3	40000	Request list not empty
3	40000	Use doppler not in auto track*		Do not use*		100000	Make angle corrections*
2	100000	S(2)				200000	No angle corrections
1,2,3,4	200000	Operational mode				400000	Print remark cards*
3,4	400000	No ODP tape		Utility mcde*	1,3	2000000	ODP input tape is complete
		ODP tape*			4,5	4000000	*

<sup>†</sup> Note: S(K) indicates scratch in Link K  
 \* indicates nominal, set initially by program

## APPENDIX C

### Format of the ODP Input Tape

Word	Contents
1 and 2	Floating double precision seconds past 1950.0. The most significant part of time is in Word 1; the least significant part of time is in Word 2.
3	Frequency increment (floating point)
4	Pass ID (BCD)
5	Code word

#### I. FORMAT OF CODE WORD

Bit:	S	1	11	12	16	17	18	21	22	25	26	35
	S	ddddd dddddd	nnnnn	a	xxxx	rrrr	ttttt tttt					

- a. If S=1, the TDEP has decreased the observation time by half the doppler averaging time.
- b. If Bit Number d=1, then data type *d* appears in the logical record as follows:

Bit Number	Data Type
1	Range (R)
2	Range rate (RRATE)
3	Elevation (EL)
4	Azimuth (AZ)
5	Declination (DEC)
6	Hour angle (HA)
7	One-way doppler (C1)
8	Two-way doppler (CC3 or C2)
9	Three-way doppler (C3)
10	Differenced one-way doppler (D1)
11	Differenced coherent three-way doppler (DC3)

- c. Bits 12–16 are not used.
- d. If *a* = 1, bits 5 and 6 correspond to right ascension (RA) and declination (DEC).
- e. xxxx is the transmitter ID (or one receiver for D1).

- f. rrrr is the receiver ID.
  - g. tttttttt is the doppler averaging time, sec.
- 6      Observable (data type) Number 1 (floating point)
- 7      Weight code word Number 1

## II. FORMAT OF WEIGHT CODE WORD

Bit:	S-1	2-4	5-7	8-10	11-14	15-17	18-20	21-35
	$D_1$	$D_2$	$D_3$	$D_4$	$D_5$	$D_6$		$t_s$

- a. The  $D_i$  are indices for *a priori* weighting by table look-up.
- b. Bits 18-20 are not used.
- c.  $t_s$  is the data type sample rate (less than  $2^{10}$  seconds).

The last two words are present for each data type in the logical record. Thus, the logical record is not of fixed length.

**APPENDIX D**  
**Tape B Format for Saved Control Records for Link 3\***

Word		Control Record Type					
		Ignore			Sample	Feary	Count
		Angles	Both	Doppler			
1	Prefix	7	4	6	3	1	2
1	Address	Station	Station	Station	Station	Station	Station
	Decrement	1 = HA(AZ) 2 = DEC(EL) 0 = Both	D = 0	1 = 2-way 2 = 1-way 4 = 3-way 8 = 1-counter 16 = 2-counter 32 = DD 64 = CCD 0 = all doppler	Sample rate	Coefficient code decrement = $10 \times i + j$	Count time for CCD
2		Start time	Start time	Start time	Start time	Coefficient $A_{ij}$	Start time
3		Stop time	Stop time	Stop time	Stop time	Coefficient $B_{ij}$	Stop time
*NOTE: Internal buffering requires that no more than 300 control records of any one type be in use in any one run.							

## APPENDIX E

### Control Card Input to the TDEP

#### **1. Making a New Master Tape**

The procedure for making a new master tape varies little from the normal procedure for updating a master tape. The basic requirements are:

- a. SS1 must be down.
- b. A CHANGE INJECTION card must be the first in the control card deck.

The INJECTION card must *never* be used at any other time.

#### **2. Updating the Master Tape**

If SS1 is up, the TDEP will add new input data to the existing master tape. (If no tape exists, the program will halt and request instructions.)

#### **3. Composition of the Input Deck**

Control card input to the TDEP falls into two classes, permanent and temporary control cards. The permanent control cards are stored on the master tape and need not be read again; temporary control words are used only for the run being made and must be read whenever needed. The permanent control cards are listed as follows; all other control cards are temporary:

CHANGE INJECTION  
CHANGE TRANSMITTER ON AT  
CHANGE BEACON TRANSMITTING AT  
CHANGE TRANSMITTERS OFF AT  
PASSID  
WEIGHT  
FREQ

SAMPLES OF VALID MARINER AND RANGER TDEP CONTROL CARDS.  
SAMPLES OF VALID MARINER, RA-5 TDEP CONTROL CARDS.

1ST WORD MUST START IN COLUMN 1

2ND WORD MUST NOT START BEFORE COLUMN 7

NOTE. XXX CAN BE ANY OF THE FOLLOWING DATA TYPES.

R,DR,EL,AZ,DEC,HA,C1,CC3,C3,D1,D3

NOTE. ZZZ CAN BE ANY OF FIVE DATA CONDITION CODES.

DC1, DC2, DC3, DC4, DC5

NOTE. QQQQQ CAN BE ANY OF THE FOLLOWING CRITERIA.

A1DEV, A2DEV, A1BIA, A2BIA, D1DEV, D2DEV, D1BIA, D2BIA

NOTE. YYYYYY CAN BE ANY OF THE FOLLOWING CLASSES OF DATA TYPES.

ANGLES, DOPPLER, COUNTER 1 DOPPLER, COUNTER 2 DOPPLER

CONTINUOUS DOPPLER, DESTRUCTIVE DOPPLER

NOTE. CHANGE IN COLUMNS 1-6 MAY BE REPLACED BY RANGER

RANGER

CHANGE

CHANGE MISSION 1

WHEN A MISSION CARD IS READ, ONLY DATA CARDS HAVING  
DC4=MISSION NUMBER WILL BE ACCEPTED, ALL OTHER CARDS ARE  
REJECTED. NO MISSION CARD IS EQUIVALENT TO A MISSION 0 CARD.

CHANGE INJECTION 620300218,3020000

AN INJECTION CARD MUST BE MADE WHEN A NEW MASTER TAPE IS  
TO BE MADE (SSI DOWN). IF AN INJECTION CARD IS READ WITH SSI  
UP, THE PROGRAM WILL HALT AND NOTIFY THE OPERATOR. THE TDEP  
MUST THEN BE RESTARTED WITH THE PROPER ADJUSTMENTS MADE.

CHANGE EPOCH 183021,61,62

AN EPOCH CARD IS READ TO ALTER TIME OF INJECTION.  
(FOR ODP DATA ONLY)

CHANGE DAY RESET 62

THE DAY RESET CARD IS USED TO SUPPLY DAY FOR AMR DATA,  
WHICH DOES NOT HAVE A DAY PUNCHED, IT CAN ALSO BE USED FOR  
DSIF DATA TO ALTER THE DAY PUNCHED IN THE CARDS.

CHANGE ID COLUMN 6

THE ID NORMALLY APPEARS IN COLUMN 4 (DSIF) OR 5 (AMR)  
IF SOME OTHER COLUMN CONTAINS THE ID, THE ID COLUMN CARD MUST  
BE READ.

CHANGE ID COLUMN 2 STATION 2

CHANGE ID COLUMN 2 EXTERNAL 11 STATION 2

CHANGE EXTERNAL 59 STATION 1

CHANGE ID COLUMN IGNORE LEADING COLUMNS 5 STATION 5

CHANGE CURRENT YEAR 63

NOMINAL YEAR IS 1963

CHANGE TRANSMITTER ON AT 183030,61, STATION 1

CHANGE TRANSMITTERS OFF AT 183035,61,

CHANGE BEACON TRANSMITTING AT 183040,61

TRANSMITTER INFORMATION IS SUPPLIED VIA TRANSMITTER CARDS.  
IT IS ASSUMED THAT ONLY ONE TRANSMITTER (STATION OR BEACON) IS  
TRANSMITTING AT ANY GIVEN TIME. THE BEACON CARD IS USED TO  
DEFINE ANY ONE-WAY DOPPLER TYPE RECEIVED FROM THE SPACECRAFT.

CHANGE MINIMUM ELEVATION ANGLE 30.0, STATION 1,3

CHANGE MAXIMUM ELEVATION ANGLE 86.41, STATION 4,6

THE ELEVATION ANGLE CARDS ARE USED TO DEFINE THE ACCEPTABLE  
RANGE OF ANGLE PAIRS

CHANGE USE DC2 MANUAL DATA

THE MANUAL DATA CARD IS USED TO ACCEPT DATA HAVING DC2=4,5.

CHANGE USE NO DOPPLER NOT IN AUTO TRACK

THE NOT IN AUTO TRACK CARD IS USED TO REJECT DATA HAVING  
DC2=1. ANGLE PAIRS ARE REJECTED IN THIS MODE.

CHANGE STATION CLASS TABLE 36

CHANGE DUPLICATE MASTER

IF A DUPLICATE MASTER CARD IS USED, THE TDEP WILL  
DUPLICATE TAPEC ONTO TAPEA BEFORE ANY CHANGES ARE MADE TO TAPEC.  
CHANGE NO ANGLE CORRECTIONS

IF REFRACTION CORRECTIONS ARE NOT DESIRED THE NO ANGLE CORRECTIONS  
CARD MUST BE USED.

CHANGE NO ODP TAPE

CHANGE NO PACK

CHANGE PACK

IF IT IS NOT DESIRED TO PRINT THE ACCEPTED DATA CARDS,  
A NO PACK CARD MAY BE USED. IF THIS OPTION IS TO BE TERMIN-  
ATED BEFORE THE END OF THE RUN, A PACK CARD SHOULD BE INSERTED  
AT THE PROPER POINT IN THE DATA.

CHANGE TIME SORT

CHANGE NO SORT

CHANGE INPUT BATCH STATION 1

CHANGE NO BATCH

THE TDEP NORMALLY REJECTS DATA OUT OF TIME SORT. IF AN  
INPUT BATCH CARD IS USED, DATA OUT OF TIME SORT BY STATION WILL  
BE REJECTED. IF A TIME SORT CARD IS USED, DATA WILL BE TIME  
SORTED AND NOT REJECTED.

CHANGE NOLIST

CHANGE LIST

IF IT IS NOT DESIRED TO PRINT REJECTED CARD IMAGES, AN  
UNLIST OR NOLIST CARD MAYBE USED.

CHANGE TAPE C=A7, TAPE A=B1, TAPE B=A4, TAPE D=B2,

THE TAPE ASSIGNMENTS MAY BE CHANGED WITH A TAPE CARD.

CHANGE INPUT TAPE B9

IF CARD IMAGES ARE READ FROM TAPE, AN INPUT TAPE CARD MUST  
BE READ, THIS TAPE MAY BE MOUNTED ON ANY UNIT NOT SPECIFIED AS  
A,B,C,OR D.

CHANGE QQQQQ .08, STATIONS 1,2

CHANGE RANGE RECYCLE 6205000

REMOVE

RMOVE ZZZ RESET STATION 1

REMOVE REJECTS STATION 1

REMOVE ACCEPTS STATION 2,3

REMOVE WEIGHTS FROM MASTER

REMOVE PASS IDS FROM MASTER

REMOVE FREQUENCIES FROM MASTER

REMOVE TRANSMITTERS FROM MASTER

COUNT AND SAMPLE CARDS ARE NOT KEPT ON THE MASTER TAPE

SAMPLE

SAMPLE TIME 30, STATION 1

SAMPLE TIME 30, BEFORE 180436,113, STATION 4

SAMPLE TIME 30, AFTER 180436,113, STATION 4

SAMPLE TIME 60, 180436,113, TO 110036,114, STATION 2

COUNT

COUNT TIME 30, STATION 1

COUNT TIME 30, BEFORE 180436,113, STATION 4

COUNT TIME 30, AFTER 180436,113, STATION 4

COUNT TIME 30, 180436,113, TO 110036,114, STATION 4

MISC.

PASSID 07261, STATION 4

PASSID 07261, 180321,113, TO 180423,114, STATION 1

WFIGHT XXX DATA TYPE 100000, STATION 4

WFIGHT XXX DATA TYPE 123456, 180431,113, TO 124632,114, STATION 1

FFARY 4, 00, 0.001, .0001, 11, .05, 0.5

REMARK 14,1 THIS REMARK CARD PRINTS IN LINK 1 WHEN KEY 14 IS DOWN.

REMARK \$35,3 THIS REMARK CARD PRINTS IN LINK 3 WHEN KEY 35 IS UP.

ACCEPT AND REJECT CARDS AFFECT RAW INPUT DATA ONLY.

ACCEPT 183022,61, TO 183023,61, STATION 1,3

ACCEPT

REJECT

REJECT STATION 1

REJECT BEFORE 183023,113, STATIONS 2,3

REJECT AT 183025,113, STATION 1

REJECT AFTER 183027,113, STATION 2

REJECT INPUT 183025,61, TO 183027,61, STATIONS 2,4,6

REJECT XXX STATION 1

REJECT XXX BEFORE 183023,113, STATION 4

REJECT XXX AT 183025,113, STATION 3

REJECT XXX AFTER 183027,113, STATION 4

REJECT XXX INPUT 183025,61, TO 183027,61, STATION 1

REJECT YYYYYY STATION 2

REJECT YYYYYY INPUT 183025,61, TO 183027,61, STATIONS 1,2

DELETE CARDS AFFECT DATA ON THE MASTER DATA TAPE ONLY.

DELETE

DELETE MASTER 183022,61, TO 183024,61, STATIONS 1,2,3

DELETE MASTER AT 183026,61, STATION 4

DELETE MASTER AFTER 183028,61, STATIONS 5,6

DELETE MASTER ALL DATA STATIONS 7,8

IGNORE CARDS AFFECT THE ODP INPUT TAPE ONLY.

IGNORE

IGNORE STATION 1

IGNORE BEFORE 183023,113, STATIONS 2,3

IGNORE AT 183025,113, STATION 1

IGNORE AFTER 183027,113, STATION 2

IGNORE DATA 183022,61, TO 183023,61, STATION 1

IGNORE XXX STATION 1

IGNORE XXX BEFORE 183023,113, STATION 4

IGNORE XXX AT 183025,113, STATION 3

IGNORE XXX AFTER 183027,113, STATION 4

IGNORE XXX DATA 183025,61, TO 183027,61, STATION 1

IGNORE YYYYYY STATION 2

IGNORE YYYYYY DATA 183025,61, TO 183027,61, STATIONS 1,2

FREQ XP1 82120 071919Z 239

DEC PT FOR VCO FREQ ASSUMED ONE PLACE FROM THE

RIGHT, SAMPLE 82120=8212.0

DEC PT FOR BEACON FREQ ASSUMED AT FAR RIGHT

SAMPLE, 32159=32159.

FORMAT

FORMAT(1X,2B,2X,1B,L2,1B,2L1,1B,3L2,1B,2(G6.3,1B),L8,1B,L3) STATION 1

FORMAT(1X,2B,2X,1B,L2,1B,4L1,1B,3L2,1B,2(G6.3,1B),L10,1B,L3) STATION 2

FORMAT(1X,2B,2X,1B,L2,1B,4L1,1B,3L2,1B,2(G6.3,1B),L10,1B,L3) STATION 3

FORMAT(1X,2B,2X,1B,L2,1B,4L1,1B,3L2,1B,2(G6.3,1B),L10,1B,L3) STATION 4

FORMAT(1X,2B,2X,1B,L2,1B,4L1,1B,3L2,1B,2(G6.3,1B),L10,1B,L3) STATION 5

FORMAT(3B,4X,L1,3L2,2Q7,Q9) STATION 6

FORMAT(3B,4X,L1,3L2,2Q7,Q9) STATION 7

FORMAT(3B,4X,L1,3L2,2Q7,Q9) STATION 8

FORMAT(3B,4X,L1,3L2,2Q7,Q9) STATION 9

ASSIGN(DC4,DC2,DC3,HR,MIN,SEC,AZ,EL,DP,DAY) STATION 1

ASSIGN(DC4,DC1,DC2,DC3,DC5,HR,MIN,SEC,HA,DEC,DP,DAY) STATION 2

ASSIGN(DC4,DC1,DC2,DC3,DC5,HR,MIN,SEC,HA,DEC,DP,DAY) STATION 3

ASSIGN(DC4,DC1,DC2,DC3,DC5,HR,MIN,SEC,HA,DEC,DP,DAY) STATION 4

ASSIGN(DC4,DC1,DC2,DC3,DC5,HR,MIN,SEC,HA,DEC,DP,DAY) STATION 5

ASSIGN(DC2,HR,MIN,SEC,AZ(AMRANG),EL(AMRANG),R(AMRRNG)) STATION 6

ASSIGN(DC2,HR,MIN,SEC,AZ(AMRANG),EL(AMRANG),R(AMRRNG)) STATION 7

ASSIGN(DC2,HR,MIN,SEC,AZ(AMRANG),EL(AMRANG),R(AMRRNG)) STATION 8  
ASSIGN(DC2,HR,MIN,SEC,AZ(AMRANG),EL(AMRANG),R(AMRRNG)) STATION 9

WHEN AMR DATA IS OLD FORMAT USE THE FOLLOWING CARDS.

CHANGE TO OLD AMR FORMAT

ASSIGN (DC2,AZ(ANTA),EL(ANTE),R(ANTR)) STATION 6

ASSIGN (DC5,DC2,AZ(ASCA),EL(ASCA),R(ASCR)) STATION 7,8,9

STATIONS NOW IN THE PROGRAM

1 = 59	6 = 74
2 = 11	7 = 75
3 = 12	8 = 77
4 = 41	9 = 76
5 = 51	

## APPENDIX F

### Sample Output

The output from two sample runs is appended, one for AMR data and one for DSIF data. The output is organized as follows:

1. The program is labeled, sense switch settings are recorded, and tape status is printed.
2. The control cards are printed.
3. Cards unacceptable to the program are listed, and an explanation is given for rejection of each card.
4. A summary of all accepted and rejected cards is printed.
5. The accepted data cards are unpacked and printed in the order read.
6. The input is summarized by station.
7. The accepted data cards are unpacked and printed in time sort by station.
8. The additions and deletions to the master tape are indicated by station.
9. The new master tape data summaries are printed.
10. Transmitter errors (if any) are listed.
11. Angle corrections are shown.
12. A summary of data on the master tape that were not used to update the ODP input tape is printed by station.
13. The internal buffering for the ODP tape merge is printed.
14. A summary of data added to the ODP input tape by data type and station is printed.

In addition, various administrative messages are printed to help the program operator.

JPL TECHNICAL MEMORANDUM NO. 33-170

TELETYPE TRACKING DATA EDITOR - TDEP - NOW OPERATING. KEYS=000000000000  
 SENSE SWITCH STATUS 1 DOWN, 2 UP, 3 DOWN, 4 UP, 5 DOWN, 6 UP,  
 TAPE STATUS A=B2, B=A4, C=A7, D=B7, INPUT=ONLINE OUTPUT = A3,  
 TAPE STATUS A=B2, C=A4, C=A7, D=B7, INPUT= B2 OUTPUT = A3,  
 CHANGE INJECTION 631200316,2830000

START CLOCK 0711/00

	CARD NUMBER	1	CHANGE TYPE CONTROL CARD
A NEW MASTER DATA TAPE WILL BE MADE USING TAPEC=A7. PLEASE PUSH START.			
CHANGE EXTERNAL 74 STATION 6	CARD NUMBER	2	CHANGE TYPE CONTROL CARD
CHANGE EXTERNAL 75 STATION 7	CARD NUMBER	3	CHANGE TYPE CONTROL CARD
CHANGE EXTERNAL 77 STATION 8	CARD NUMBER	4	CHANGE TYPE CONTROL CARD
CHANGE DAY RESET 337	CARD NUMBER	5	CHANGE TYPE CONTROL CARD
CAPJET STARTING STA 74 TRACKING DATA	CARD NO.	6 REJECTED	- UNRECOGNIZABLE -
CAPJET END STA 74 TRACKING DATA	CARD NO.	7 REJECTED	- UNRECOGNIZABLE -
CAPJET STARTING STA 77 TRACKING DATA SHIP POS RI 63780 LAT 150 LON 3150	CARD NO.	38 REJECTED	- UNRECOGNIZABLE -
CAPJET END STA 77 DATA	CARD NO.	39 REJECTED	- UNRECOGNIZABLE -
CAPJET STARTING STA 75 TRACKING DATA	CARD NO.	40 REJECTED	- UNRECOGNIZABLE -
TDEP PROGRAM LINK 2 IS OPERATING.	CARD NO.	41 REJECTED	- UNRECOGNIZABLE -
SUMMARY OF THE 195 CARDS READ. 171 ACCEPTED, 24 REJECTED, 24 UNRECOGNIZABLE, 0 FORMAT ERRORS, 0 DATA RANGE). B2 IS THE PRINT TAPE OF ALL RAW INPUT. PLEASE REMOVE AND PRINT SINGLE SPACED.	CARD NO.	42 REJECTED	- UNRECOGNIZABLE -
CAPJET STARTING STA 75 TRACKING DATA	CARD NO.	43 REJECTED	- UNRECOGNIZABLE -
CAPJET END STA 75 TRACKING DATA	CARD NO.	44 REJECTED	- UNRECOGNIZABLE -
CAPJET STARTING STA 77 TRACKING DATA	CARD NO.	45 REJECTED	- UNRECOGNIZABLE -
CAPJET END STA 77 DATA	CARD NO.	46 REJECTED	- UNRECOGNIZABLE -
CAPJET STARTING STA 74 TRACKING DATA	CARD NO.	47 REJECTED	- UNRECOGNIZABLE -
CAPJET END STA 74 DATA	CARD NO.	48 REJECTED	- UNRECOGNIZABLE -
CAPJET STARTING STA 75 TRACKING DATA	CARD NO.	119 REJECTED	- UNRECOGNIZABLE -
CAPJET END STA 75 DATA	CARD NO.	120 REJECTED	- UNRECOGNIZABLE -
CAPJET STARTING STA 77 TRACKING DATA	CARD NO.	121 REJECTED	- UNRECOGNIZABLE -
CAPJET END STA 77 DATA	CARD NO.	122 REJECTED	- UNRECOGNIZABLE -
CAPJET STARTING STA 74 TRACKING DATA	CARD NO.	123 REJECTED	- UNRECOGNIZABLE -
CAPJET END STA 74 DATA	CARD NO.	124 REJECTED	- UNRECOGNIZABLE -
CAPJET STARTING STA 75 TRACKING DATA	CARD NO.	125 REJECTED	- UNRECOGNIZABLE -
CAPJET END STA 75 DATA	CARD NO.	126 REJECTED	- UNRECOGNIZABLE -
CAPJET STARTING STA 77 TRACKING DATA	CARD NO.	127 REJECTED	- UNRECOGNIZABLE -
CAPJET END STA 77 DATA	CARD NO.	128 REJECTED	- UNRECOGNIZABLE -
CAPJET STARTING STA 74 TRACKING DATA	CARD NO.	129 REJECTED	- UNRECOGNIZABLE -

166 DATA CARDS ACCEPTED ARE UNPACKED BELOW. \* INDICATES BAD DATA.

ID DCC G.M.T. DAY	AZ/HA	EL/DEC	TYPE	DOPPLER/RANGE	DAT	SECONDS	145	CNTR	CARD
6 020 163000 337	31.500	13.019	AZ/EL	RANGE= 680.54	1	90.0	00	1	6
6 020 163006 337	35.173	12.759	AZ/EL	RANGE= 689.24	1	96.0	00	1	9
6 020 163012 337	38.828	12.476	AZ/EL	RANGE= 700.59	1	102.0	00	1	10
6 020 163018 337	42.283	11.991	AZ/EL	RANGE= 714.32	1	108.0	00	1	11
6 020 163024 337	45.586	11.623	AZ/EL	RANGE= 730.45	1	114.0	00	1	12
6 020 163030 337	48.758	11.214	AZ/EL	RANGE= 746.76	1	120.0	00	1	13
6 020 163036 337	51.785	10.709	AZ/EL	RANGE= 769.08	1	126.0	00	1	14
6 020 163042 337	54.554	10.276	AZ/EL	RANGE= 791.21	1	132.0	00	1	15
6 020 163048 337	57.262	9.656	AZ/EL	RANGE= 815.08	1	138.0	00	1	16
6 020 163054 337	59.716	9.224	AZ/EL	RANGE= 840.55	1	144.0	00	1	17
6 020 163100 337	62.067	8.731	AZ/EL	RANGE= 867.40	1	150.0	00	1	18
6 020 163106 337	64.237	8.159	AZ/EL	RANGE= 895.55	1	156.0	00	1	19
6 020 163112 337	66.262	7.697	AZ/EL	RANGE= 924.94	1	162.0	00	1	20
6 020 163118 337	68.228	7.182	AZ/EL	RANGE= 955.33	1	168.0	00	1	21
6 020 163124 337	70.060	6.661	AZ/EL	RANGE= 986.70	1	174.0	00	1	22
6 020 163130 337	71.632	6.180	AZ/EL	RANGE= 1018.95	1	180.0	00	1	23
6 020 163136 337	73.267	5.721	AZ/EL	RANGE= 1051.99	1	186.0	00	1	24
6 020 163142 337	74.715	5.281	AZ/EL	RANGE= 1085.77	1	192.0	00	1	25
6 020 163148 337	76.032	4.802	AZ/EL	RANGE= 1120.23	1	198.0	00	1	26
6 020 163154 337	77.373	4.354	AZ/EL	RANGE= 1155.27	1	204.0	00	1	27
6 020 163200 337	78.639	3.907	AZ/EL	RANGE= 1190.80	1	210.0	00	1	28

6	020	163206	337	79.799	3.512	AZ/EL	RANGE=	1226.87	1	216.0	00	1	29
6	020	163212	337	80.830	3.121	AZ/EL	RANGE=	1263.36	1	222.0	00	1	30
6	020	163218	337	81.930	2.740	AZ/EL	RANGE=	1300.28	1	228.0	00	1	31
6	020	163224	337	82.831	2.442	AZ/EL	RANGE=	1337.63	1	234.0	00	1	32
6	020	163230	337	83.743	2.018	AZ/EL	RANGE=	1375.22	1	240.0	00	1	33
6	020	163236	337	84.600	1.667	AZ/EL	RANGE=	1413.22	1	246.0	00	1	34
6	020	163242	337	85.381	1.340	AZ/EL	RANGE=	1451.49	1	252.0	00	1	35
6	020	163248	337	86.179	1.029	AZ/EL	RANGE=	1489.96	1	258.0	00	1	36
6	020	163254	337	86.905	.673	AZ/EL	RANGE=	1528.71	1	264.0	00	1	37
8	020	163019	337	301.504	.700	AZ/EL	RANGE=	5.94	1	109.0	00	1	49
8	020	163025	337	301.643	1.038	AZ/EL	RANGE=	1478.75	1	115.0	00	1	50
8	020	163031	337	301.771	1.397	AZ/EL	RANGE=	1435.81	1	121.0	00	1	51
8	020	163037	337	301.870	1.768	AZ/EL	RANGE=	1392.88	1	127.0	00	1	52
8	020	163043	337	302.104	2.191	AZ/EL	RANGE=	1349.97	1	133.0	00	1	53
8	020	163049	337	302.239	2.591	AZ/EL	RANGE=	1307.08	1	139.0	00	1	54
8	020	163055	337	302.397	3.059	AZ/EL	RANGE=	1264.25	1	145.0	00	1	55
8	020	163101	337	302.559	3.554	AZ/EL	RANGE=	1221.38	1	151.0	00	1	56
8	020	163107	337	302.825	4.021	AZ/EL	RANGE=	1178.57	1	157.0	00	1	57
8	020	163113	337	303.000	4.524	AZ/EL	RANGE=	1135.79	1	163.0	00	1	58
8	020	163119	337	303.248	5.089	AZ/EL	RANGE=	1093.08	1	169.0	00	1	59
8	020	163125	337	303.507	5.647	AZ/EL	RANGE=	1050.43	1	175.0	00	1	60
8	020	163131	337	303.785	6.278	AZ/EL	RANGE=	1007.83	1	181.0	00	1	61
8	020	163137	337	304.076	6.918	AZ/EL	RANGE=	965.30	1	187.0	00	1	62
8	020	163143	337	304.390	7.610	AZ/EL	RANGE=	922.87	1	193.0	00	1	63
8	020	163149	337	304.737	8.335	AZ/EL	RANGE=	880.49	1	199.0	00	1	64
8	020	163155	337	305.143	9.133	AZ/EL	RANGE=	838.30	1	205.0	00	1	65
8	020	163201	337	305.587	9.984	AZ/EL	RANGE=	796.20	1	211.0	00	1	66
8	020	163207	337	306.086	10.965	AZ/EL	RANGE=	754.25	1	217.0	00	1	67
8	020	163213	337	306.576	11.978	AZ/EL	RANGE=	712.53	1	223.0	00	1	68
8	020	163219	337	307.215	13.122	AZ/EL	RANGE=	671.03	1	229.0	00	1	69
8	020	163225	337	307.892	14.357	AZ/EL	RANGE=	629.81	1	235.0	00	1	70
8	020	163231	337	308.674	15.775	AZ/EL	RANGE=	588.93	1	241.0	00	1	71
8	020	163237	337	309.606	17.377	AZ/EL	RANGE=	548.46	1	247.0	00	1	72
8	020	163243	337	310.741	19.219	AZ/EL	RANGE=	508.53	1	253.0	00	1	73
8	020	163249	337	312.040	21.260	AZ/EL	RANGE=	469.22	1	259.0	00	1	74
8	020	163255	337	313.672	23.624	AZ/EL	RANGE=	430.81	1	265.0	00	1	75
8	020	163301	337	315.654	26.459	AZ/EL	RANGE=	393.41	1	271.0	00	1	76
8	020	163307	337	318.153	29.729	AZ/EL	RANGE=	357.49	1	277.0	00	1	77
8	020	163313	337	321.482	33.594	AZ/EL	RANGE=	323.49	1	283.0	00	1	78
8	020	163319	337	325.955	38.152	AZ/EL	RANGE=	292.03	1	289.0	00	1	79
8	020	163325	337	332.165	43.468	AZ/EL	RANGE=	264.09	1	295.0	00	1	80
8	020	163331	337	341.364	49.244	AZ/EL	RANGE=	240.83	1	301.0	00	1	81
8	020	163337	337	355.096	54.886	AZ/EL	RANGE=	223.83	1	307.0	00	1	82
8	020	163343	337	14.348	58.786	AZ/EL	RANGE=	214.48	1	313.0	00	1	83
8	020	163349	337	37.425	59.123	AZ/EL	RANGE=	213.80	1	319.0	00	1	84
8	020	163355	337	57.823	55.634	AZ/EL	RANGE=	221.95	1	325.0	00	1	85
8	020	163401	337	72.332	50.146	AZ/EL	RANGE=	237.93	1	331.0	00	1	86
8	020	163407	337	82.088	44.257	AZ/EL	RANGE=	260.37	1	337.0	00	1	87
8	020	163413	337	88.674	38.889	AZ/EL	RANGE=	287.71	1	343.0	00	1	88
8	020	163419	337	93.355	34.212	AZ/EL	RANGE=	318.71	1	349.0	00	1	89
8	020	163425	337	98.826	30.270	AZ/EL	RANGE=	352.36	1	355.0	00	1	90
8	020	163431	337	99.451	26.876	AZ/EL	RANGE=	388.09	1	361.0	00	1	91
8	020	163437	337	101.482	24.035	AZ/EL	RANGE=	425.26	1	367.0	00	1	92
8	020	163443	337	103.153	21.617	AZ/EL	RANGE=	463.59	1	373.0	00	1	93
8	020	163449	337	104.488	19.518	AZ/EL	RANGE=	502.73	1	379.0	00	1	94
8	020	163455	337	105.612	17.664	AZ/EL	RANGE=	542.61	1	385.0	00	1	95
8	020	163501	337	106.561	16.039	AZ/EL	RANGE=	583.04	1	391.0	00	1	96
8	020	163507	337	107.381	14.583	AZ/EL	RANGE=	623.82	1	397.0	00	1	97
8	020	163513	337	108.119	13.323	AZ/EL	RANGE=	665.03	1	403.0	00	1	98
8	020	163519	337	108.702	12.165	AZ/EL	RANGE=	706.49	1	409.0	00	1	99
8	020	163525	337	109.302	11.094	AZ/EL	RANGE=	748.20	1	415.0	00	1	100
8	020	163531	337	109.796	10.142	AZ/EL	RANGE=	790.11	1	421.0	00	1	101
8	020	163537	337	110.220	9.299	AZ/EL	RANGE=	832.19	1	427.0	00	1	102
8	020	163543	337	110.588	8.477	AZ/EL	RANGE=	874.39	1	433.0	00	1	103
8	020	163549	337	110.940	7.720	AZ/EL	RANGE=	916.73	1	439.0	00	1	104

8	020	163555	337	111.270	7.001	AZ/EL	RANGE=	959.17	1	445.0	00	1	105
8	020	163601	337	111.603	6.392	AZ/EL	RANGE=	1001.70	1	451.0	00	1	106
8	020	163607	337	111.864	5.740	AZ/EL	RANGE=	1044.34	1	457.0	00	1	107
8	020	163613	337	112.091	5.142	AZ/EL	RANGE=	1086.97	1	463.0	00	1	108
8	020	163619	337	112.309	4.611	AZ/EL	RANGE=	1129.68	1	469.0	00	1	109
8	020	163625	337	112.571	4.115	AZ/EL	RANGE=	1172.48	1	475.0	00	1	110
8	020	163631	337	112.770	3.620	AZ/EL	RANGE=	1215.32	1	481.0	00	1	111
8	020	163637	337	112.914	3.155	AZ/EL	RANGE=	1258.11	1	487.0	00	1	112
8	020	163643	337	113.128	2.690	AZ/EL	RANGE=	1301.00	1	493.0	00	1	113
8	020	163649	337	113.303	2.272	AZ/EL	RANGE=	1343.91	1	499.0	00	1	114
8	020	163655	337	113.437	1.846	AZ/EL	RANGE=	1386.83	1	505.0	00	1	115
8	020	163701	337	113.561	1.481	AZ/EL	RANGE=	1429.82	1	511.0	00	1	116
8	020	163707	337	113.724	1.082	AZ/EL	RANGE=	1472.75	1	517.0	00	1	117
8	020	163713	337	113.880	.711	AZ/EL	RANGE=	1515.72	1	523.0	00	1	118
7	020	164018	337	324.183	.628	AZ/EL	RANGE=	1540.07	1	708.0	00	1	130
7	020	164024	337	324.829	.967	AZ/EL	RANGE=	1500.27	1	714.0	00	1	131
7	020	164030	337	325.509	1.243	AZ/EL	RANGE=	1460.66	1	720.0	00	1	132
7	020	164036	337	326.236	1.556	AZ/EL	RANGE=	1421.26	1	726.0	00	1	133
7	020	164042	337	326.975	1.854	AZ/EL	RANGE=	1382.11	1	732.0	00	1	134
7	020	164048	337	327.785	2.371	AZ/EL	RANGE=	1343.18	1	738.0	00	1	135
7	020	164054	337	328.633	2.563	AZ/EL	RANGE=	1304.55	1	744.0	00	1	136
7	020	164100	337	329.557	3.085	AZ/EL	RANGE=	1266.17	1	750.0	00	1	137
7	020	164106	337	330.451	3.452	AZ/EL	RANGE=	1228.15	1	756.0	00	1	138
7	020	164112	337	331.510	3.831	AZ/EL	RANGE=	1190.49	1	762.0	00	1	139
7	020	164118	337	332.584	4.399	AZ/EL	RANGE=	1153.25	1	768.0	00	1	140
7	020	164124	337	333.756	4.799	AZ/EL	RANGE=	1116.44	1	774.0	00	1	141
7	020	164130	337	334.966	5.314	AZ/EL	RANGE=	1080.13	1	780.0	00	1	142
7	020	164136	337	336.276	5.766	AZ/EL	RANGE=	1044.34	1	786.0	00	1	143
7	020	164142	337	337.703	6.294	AZ/EL	RANGE=	1009.16	1	792.0	00	1	144
7	020	164148	337	339.230	6.795	AZ/EL	RANGE=	974.63	1	798.0	00	1	145
7	020	164154	337	340.909	7.337	AZ/EL	RANGE=	940.85	1	804.0	00	1	146
7	020	164200	337	342.601	7.952	AZ/EL	RANGE=	907.92	1	810.0	00	1	147
7	020	164206	337	344.591	8.479	AZ/EL	RANGE=	875.84	1	816.0	00	1	148
7	020	164212	337	346.630	9.033	AZ/EL	RANGE=	844.88	1	822.0	00	1	149
7	020	164218	337	348.831	9.559	AZ/EL	RANGE=	815.01	1	828.0	00	1	150
7	020	164224	337	351.210	10.348	AZ/EL	RANGE=	786.45	1	834.0	00	1	151
7	020	164230	337	353.813	10.913	AZ/EL	RANGE=	759.32	1	840.0	00	1	152
7	020	164236	337	356.555	11.509	AZ/EL	RANGE=	733.77	1	846.0	00	1	153
7	020	164242	337	359.516	12.114	AZ/EL	RANGE=	709.94	1	852.0	00	1	154
7	020	164248	337	2.339	12.767	AZ/EL	RANGE=	688.10	1	858.0	00	1	155
7	020	164254	337	5.750	13.183	AZ/EL	RANGE=	668.35	1	864.0	00	1	156
7	020	164300	337	9.377	13.816	AZ/EL	RANGE=	650.96	1	870.0	00	1	157
7	020	164306	337	13.134	14.203	AZ/EL	RANGE=	636.09	1	876.0	00	1	158
7	020	164312	337	17.138	14.604	AZ/EL	RANGE=	623.90	1	882.0	00	1	159
7	020	164318	337	21.269	14.944	AZ/EL	RANGE=	614.58	1	888.0	00	1	160
7	020	164324	337	25.564	15.140	AZ/EL	RANGE=	608.28	1	894.0	00	1	161
7	020	164330	337	29.872	15.286	AZ/EL	RANGE=	605.03	1	900.0	00	1	162
7	020	164336	337	34.218	15.269	AZ/EL	RANGE=	604.94	1	906.0	00	1	163
7	020	164342	337	38.547	15.130	AZ/EL	RANGE=	607.96	1	912.0	00	1	164
7	020	164348	337	42.827	14.954	AZ/EL	RANGE=	614.10	1	918.0	00	1	165
7	020	164354	337	46.966	14.618	AZ/EL	RANGE=	623.23	1	924.0	00	1	166
7	020	164400	337	50.942	14.332	AZ/EL	RANGE=	635.24	1	930.0	00	1	167
7	020	164406	337	54.751	13.864	AZ/EL	RANGE=	649.96	1	936.0	00	1	168
7	020	164412	337	58.388	13.308	AZ/EL	RANGE=	667.26	1	942.0	00	1	169
7	020	164418	337	61.811	12.692	AZ/EL	RANGE=	686.83	1	948.0	00	1	170
7	020	164424	337	65.017	12.138	AZ/EL	RANGE=	708.58	1	954.0	00	1	171
7	020	164430	337	67.993	11.556	AZ/EL	RANGE=	732.30	1	960.0	00	1	172
7	020	164436	337	70.775	10.981	AZ/EL	RANGE=	757.73	1	966.0	00	1	173
7	020	164442	337	73.376	10.303	AZ/EL	RANGE=	784.80	1	972.0	00	1	174
7	020	164448	337	75.712	9.704	AZ/EL	RANGE=	813.29	1	978.0	00	1	175
7	020	164454	337	77.992	9.081	AZ/EL	RANGE=	843.09	1	984.0	00	1	176
7	020	164500	337	80.003	8.530	AZ/EL	RANGE=	874.03	1	990.0	00	1	177
7	020	164506	337	81.927	7.902	AZ/EL	RANGE=	906.00	1	996.0	00	1	178
7	020	164512	337	83.716	7.383	AZ/EL	RANGE=	938.90	1	1002.0	00	1	179
7	020	164518	337	85.302	6.878	AZ/EL	RANGE=	972.64	1	1008.0	00	1	180

7	020	164524	337	86.917	6.372	AZ/EL	RANGE= 1007.15	1	1014.0	00	1	181
7	020	164530	337	88.314	5.878	AZ/EL	RANGE= 1042.32	1	1020.0	00	1	182
7	020	164536	337	89.646	5.330	AZ/EL	RANGE= 1078.07	1	1026.0	00	1	183
7	020	164542	337	90.887	4.707	AZ/EL	RANGE= 1114.40	1	1032.0	00	1	184
7	020	164548	337	92.040	4.384	AZ/EL	RANGE= 1151.20	1	1038.0	00	1	185
7	020	164554	337	93.157	3.839	AZ/EL	RANGE= 1188.44	1	1044.0	00	1	186
7	020	164600	337	94.142	3.434	AZ/EL	RANGE= 1226.11	1	1050.0	00	1	187
7	020	164606	337	95.084	3.149	AZ/EL	RANGE= 1264.13	1	1056.0	00	1	188
7	020	164612	337	96.030	2.718	AZ/EL	RANGE= 1302.47	1	1062.0	00	1	189
7	020	164618	337	96.058	2.305	AZ/EL	RANGE= 1341.14	1	1068.0	00	1	190
7	020	164624	337	97.657	1.921	AZ/EL	RANGE= 1380.06	1	1074.0	00	1	191
7	020	164630	337	98.424	1.585	AZ/EL	RANGE= 1419.27	1	1080.0	00	1	192
7	020	164636	337	99.071	1.184	AZ/EL	RANGE= 1458.66	1	1086.0	00	1	193
7	020	164642	337	99.763	.814	AZ/EL	RANGE= 1498.29	1	1092.0	00	1	194
7	020	164648	337	100.449	.678	AZ/EL	RANGE= 1538.13	1	1098.0	00	1	195

INPUT DATA SUMMARY.			STA COUNT	HHMMSS, DAY	TO	HHMMSS, DAY	ELAPSED	HHMMSS, DAYS	TIMES IN SECONDS	ELAPSED	
6	30	163000	337	163254	337		000254	0	90.0	264.0	176.0
7	66	164018	337	164648	337		000630	0	708.0	1098.0	390.0
8	70	163019	337	163713	337		000654	0	109.0	523.0	414.0

UNPACK COMPLETE.

NO DATA OUT OF TIME SORT

CORE SORT BY STATION COMPLETE.

CORE SORT BY TIME COMPLETE.

166 DATA CARDS ACCEPTED ARE UNPACKED BELOW. • INDICATES BAD DATA.

ID	DCC	G.M.T.	DAY	AZ/HA	EL/DEC	TYPE	DOPPLER/RANGE	DAT	SECONDS	U45	CNTR	CARD
6	020	163000	337	31.500	13.019	AZ/EL	RANGE= 680.54	1	90.0	00	1	8
6	020	163006	337	35.173	12.759	AZ/EL	RANGE= 689.24	1	96.0	00	1	9
6	020	163012	337	38.828	12.476	AZ/EL	RANGE= 700.59	1	102.0	00	1	10
6	020	163018	337	42.283	11.991	AZ/EL	RANGE= 714.32	1	108.0	00	1	11
6	020	163024	337	45.586	11.623	AZ/EL	RANGE= 730.45	1	114.0	00	1	12
6	020	163030	337	48.758	11.214	AZ/EL	RANGE= 748.76	1	120.0	00	1	13
6	020	163036	337	51.785	10.709	AZ/EL	RANGE= 769.03	1	126.0	00	1	14
6	020	163042	337	54.554	10.276	AZ/EL	RANGE= 791.21	1	132.0	00	1	15
6	020	163048	337	57.262	9.656	AZ/EL	RANGE= 815.08	1	138.0	00	1	16
6	020	163054	337	59.716	9.224	AZ/EL	RANGE= 840.55	1	144.0	00	1	17
6	020	163100	337	62.067	8.731	AZ/EL	RANGE= 867.40	1	150.0	00	1	18
6	020	163106	337	64.237	8.159	AZ/EL	RANGE= 895.55	1	156.0	00	1	19
6	020	163112	337	66.262	7.697	AZ/EL	RANGE= 924.94	1	162.0	00	1	20
6	020	163118	337	68.228	7.182	AZ/EL	RANGE= 955.33	1	168.0	00	1	21
6	020	163124	337	70.060	6.661	AZ/EL	RANGE= 986.70	1	174.0	00	1	22
6	020	163130	337	71.632	6.180	AZ/EL	RANGE= 1018.95	1	180.0	00	1	23
6	020	163136	337	73.267	5.721	AZ/EL	RANGE= 1051.99	1	186.0	00	1	24
6	020	163142	337	74.715	5.281	AZ/EL	RANGE= 1085.77	1	192.0	00	1	25
6	020	163148	337	76.032	4.802	AZ/EL	RANGE= 1120.23	1	198.0	00	1	26
6	020	163154	337	77.373	4.354	AZ/EL	RANGE= 1155.27	1	204.0	00	1	27
6	020	163200	337	78.639	3.907	AZ/EL	RANGE= 1190.80	1	210.0	00	1	28
6	020	163206	337	79.799	3.512	AZ/EL	RANGE= 1226.87	1	216.0	00	1	29
6	020	163212	337	80.830	3.121	AZ/EL	RANGE= 1263.36	1	222.0	00	1	30
6	020	163218	337	81.930	2.740	AZ/EL	RANGE= 1300.28	1	228.0	00	1	31
6	020	163224	337	82.831	2.442	AZ/EL	RANGE= 1337.63	1	234.0	00	1	32
6	020	163230	337	83.743	2.018	AZ/EL	RANGE= 1375.22	1	240.0	00	1	33
6	020	163236	337	84.600	1.667	AZ/EL	RANGE= 1413.22	1	246.0	00	1	34
6	020	163242	337	85.381	1.340	AZ/EL	RANGE= 1451.49	1	252.0	00	1	35
6	020	163248	337	86.179	1.029	AZ/EL	RANGE= 1489.96	1	258.0	00	1	36
6	020	163254	337	86.905	.673	AZ/EL	RANGE= 1528.71	1	264.0	00	1	37
8	020	163019	337	301.504	.700	AZ/EL	RANGE= 5.94	1	109.0	00	1	49
8	020	163025	337	301.643	1.038	AZ/EL	RANGE= 1478.75	1	115.0	00	1	50
8	020	163031	337	301.777	1.397	AZ/EL	RANGE= 1435.81	1	121.0	00	1	51
8	020	163037	337	301.870	1.768	AZ/EL	RANGE= 1392.88	1	127.0	00	1	52

8 020	163043	337	302.104	2.191	AZ/EL	RANGE= 1349.97	1	133.0	00	1	53
8 020	163049	337	302.239	2.591	AZ/EL	RANGE= 1307.08	1	139.0	00	1	54
8 020	163055	337	302.397	3.059	AZ/EL	RANGE= 1264.25	1	145.0	00	1	55
8 020	163101	337	302.559	3.554	AZ/EL	RANGE= 1221.38	1	151.0	00	1	56
8 020	163107	337	302.825	4.021	AZ/EL	RANGE= 1178.57	1	157.0	00	1	57
8 020	163113	337	303.000	4.524	AZ/EL	RANGE= 1135.79	1	163.0	00	1	58
8 020	163119	337	303.248	5.089	AZ/EL	RANGE= 1093.08	1	169.0	00	1	59
8 020	163125	337	303.507	5.647	AZ/EL	RANGE= 1050.43	1	175.0	00	1	60
8 020	163131	337	303.785	6.278	AZ/EL	RANGE= 1007.83	1	181.0	00	1	61
8 020	163137	337	304.076	6.918	AZ/EL	RANGE= 965.30	1	187.0	00	1	62
8 020	163143	337	304.390	7.610	AZ/EL	RANGE= 922.87	1	193.0	00	1	63
8 020	163149	337	304.737	8.335	AZ/EL	RANGE= 880.49	1	199.0	00	1	64
8 020	163155	337	305.143	9.133	AZ/EL	RANGE= 838.30	1	205.0	00	1	65
8 020	163201	337	305.587	9.984	AZ/EL	RANGE= 796.20	1	211.0	00	1	66
8 020	163207	337	306.086	10.965	AZ/EL	RANGE= 754.25	1	217.0	00	1	67
8 020	163213	337	306.576	11.978	AZ/EL	RANGE= 712.53	1	223.0	00	1	68
8 020	163219	337	307.215	13.122	AZ/EL	RANGE= 671.03	1	229.0	00	1	69
8 020	163225	337	307.892	14.357	AZ/EL	RANGE= 629.81	1	235.0	00	1	70
8 020	163231	337	308.674	15.775	AZ/EL	RANGE= 588.93	1	241.0	00	1	71
8 020	163237	337	309.606	17.377	AZ/EL	RANGE= 548.46	1	247.0	00	1	72
8 020	163243	337	310.741	19.219	AZ/EL	RANGE= 508.53	1	253.0	00	1	73
8 020	163249	337	312.040	21.260	AZ/EL	RANGE= 469.22	1	259.0	00	1	74
8 020	163255	337	313.672	23.624	AZ/EL	RANGE= 430.81	1	265.0	00	1	75
8 020	163301	337	315.654	26.459	AZ/EL	RANGE= 393.41	1	271.0	00	1	76
8 020	163307	337	318.153	29.729	AZ/EL	RANGE= 357.49	1	277.0	00	1	77
8 020	163313	337	321.482	33.594	AZ/EL	RANGE= 323.49	1	283.0	00	1	78
8 020	163319	337	325.955	38.152	AZ/EL	RANGE= 292.03	1	289.0	00	1	79
8 020	163325	337	332.165	43.468	AZ/EL	RANGE= 264.09	1	295.0	00	1	80
8 020	163331	337	341.364	49.244	AZ/EL	RANGE= 240.83	1	301.0	00	1	81
8 020	163337	337	355.096	54.886	AZ/EL	RANGE= 223.83	1	307.0	00	1	82
8 020	163343	337	14.348	58.786	AZ/EL	RANGE= 214.48	1	313.0	00	1	83
8 020	163349	337	37.425	59.123	AZ/EL	RANGE= 213.80	1	319.0	00	1	84
8 020	163355	337	57.823	55.634	AZ/EL	RANGE= 221.95	1	325.0	00	1	85
8 020	163401	337	72.332	50.146	AZ/EL	RANGE= 237.93	1	331.0	00	1	86
8 020	163407	337	82.088	44.257	AZ/EL	RANGE= 260.37	1	337.0	00	1	87
8 020	163413	337	88.674	38.889	AZ/EL	RANGE= 287.71	1	343.0	00	1	88
8 020	163419	337	93.355	34.212	AZ/EL	RANGE= 318.71	1	349.0	00	1	89
8 020	163425	337	96.826	30.270	AZ/EL	RANGE= 352.36	1	355.0	00	1	90
8 020	163431	337	99.451	26.876	AZ/EL	RANGE= 388.09	1	361.0	00	1	91
8 020	163437	337	101.462	24.055	AZ/EL	RANGE= 425.20	1	367.0	00	1	92
8 020	163443	337	103.153	21.617	AZ/EL	RANGE= 463.59	1	373.0	00	1	93
8 020	163449	337	104.488	19.518	AZ/EL	RANGE= 502.73	1	379.0	00	1	94
8 020	163455	337	105.612	17.664	AZ/EL	RANGE= 542.61	1	385.0	00	1	95
8 020	163501	337	106.561	16.039	AZ/EL	RANGE= 583.04	1	391.0	00	1	96
8 020	163507	337	107.381	14.583	AZ/EL	RANGE= 623.82	1	397.0	00	1	97
8 020	163513	337	108.119	13.323	AZ/EL	RANGE= 665.03	1	403.0	00	1	98
8 020	163519	337	108.702	12.165	AZ/EL	RANGE= 706.49	1	409.0	00	1	99
8 020	163525	337	109.302	11.094	AZ/EL	RANGE= 748.20	1	415.0	00	1	100
8 020	163531	337	109.796	10.142	AZ/EL	RANGE= 790.11	1	421.0	00	1	101
8 020	163537	337	110.220	9.299	AZ/EL	RANGE= 832.19	1	427.0	00	1	102
8 020	163543	337	110.588	8.477	AZ/EL	RANGE= 874.39	1	433.0	00	1	103
8 020	163549	337	110.940	7.720	AZ/EL	RANGE= 916.73	1	439.0	00	1	104
8 020	163555	337	111.270	7.001	AZ/EL	RANGE= 959.17	1	445.0	00	1	105
8 020	163601	337	111.603	6.392	AZ/EL	RANGE= 1001.70	1	451.0	00	1	106
8 020	163607	337	111.864	5.740	AZ/EL	RANGE= 1044.34	1	457.0	00	1	107
8 020	163613	337	112.091	5.142	AZ/EL	RANGE= 1086.97	1	463.0	00	1	108
8 020	163619	337	112.309	4.611	AZ/EL	RANGE= 1129.68	1	469.0	00	1	109
8 020	163625	337	112.571	4.115	AZ/EL	RANGE= 1172.48	1	475.0	00	1	110
8 020	163631	337	112.770	3.620	AZ/EL	RANGE= 1215.32	1	481.0	00	1	111
8 020	163637	337	112.914	3.155	AZ/EL	RANGE= 1258.11	1	487.0	00	1	112
8 020	163643	337	113.128	2.690	AZ/EL	RANGE= 1301.00	1	493.0	00	1	113
8 020	163649	337	113.303	2.272	AZ/EL	RANGE= 1343.91	1	499.0	00	1	114
8 020	163655	337	113.437	1.846	AZ/EL	RANGE= 1386.83	1	505.0	00	1	115
8 020	163701	337	113.561	1.481	AZ/EL	RANGE= 1429.82	1	511.0	00	1	116
8 020	163707	337	113.724	1.082	AZ/EL	RANGE= 1472.75	1	517.0	00	1	117
8 020	163713	337	113.880	.711	AZ/EL	RANGE= 1515.72	1	523.0	00	1	118

7 020	164018	337	324.183	.628	AZ/EL	RANGE=	1540.07	1	708.0	00	1	130
7 020	164024	337	324.829	.967	AZ/EL	RANGE=	1500.27	1	714.0	00	1	131
7 020	164030	337	325.509	1.243	AZ/EL	RANGE=	1460.66	1	720.0	00	1	132
7 020	164036	337	326.236	1.556	AZ/EL	RANGE=	1421.26	1	726.0	00	1	133
7 020	164042	337	326.975	1.854	AZ/EL	RANGE=	1382.11	1	732.0	00	1	134
7 020	164048	337	327.785	2.371	AZ/EL	RANGE=	1343.18	1	738.0	00	1	135
7 020	164054	337	328.633	2.563	AZ/EL	RANGE=	1304.55	1	744.0	00	1	136
7 020	164100	337	329.557	3.085	AZ/EL	RANGE=	1266.17	1	750.0	00	1	137
7 020	164106	337	330.451	3.452	AZ/EL	RANGE=	1228.15	1	756.0	00	1	138
7 020	164112	337	331.510	3.831	AZ/EL	RANGE=	1190.49	1	762.0	00	1	139
7 020	164118	337	332.584	4.399	AZ/EL	RANGE=	1153.25	1	768.0	00	1	140
7 020	164124	337	333.756	4.799	AZ/EL	RANGE=	1116.44	1	774.0	00	1	141
7 020	164130	337	334.966	5.314	AZ/EL	RANGE=	1080.13	1	780.0	00	1	142
7 020	164136	337	336.276	5.766	AZ/EL	RANGE=	1044.34	1	786.0	00	1	143
7 020	164142	337	337.703	6.294	AZ/EL	RANGE=	1009.16	1	792.0	00	1	144
7 020	164148	337	339.230	6.795	AZ/EL	RANGE=	974.63	1	798.0	00	1	145
7 020	164154	337	340.909	7.337	AZ/EL	RANGE=	940.85	1	804.0	00	1	146
7 020	164200	337	342.601	7.952	AZ/EL	RANGE=	907.92	1	810.0	00	1	147
7 020	164206	337	344.591	8.479	AZ/EL	RANGE=	875.84	1	816.0	00	1	148
7 020	164212	337	346.630	9.033	AZ/EL	RANGE=	844.88	1	822.0	00	1	149
7 020	164218	337	348.831	9.559	AZ/EL	RANGE=	815.01	1	828.0	00	1	150
7 020	164224	337	351.210	10.348	AZ/EL	RANGE=	786.45	1	834.0	00	1	151
7 020	164230	337	353.813	10.913	AZ/EL	RANGE=	759.32	1	840.0	00	1	152
7 020	164236	337	356.555	11.509	AZ/EL	RANGE=	733.77	1	846.0	00	1	153
7 020	164242	337	359.516	12.118	AZ/EL	RANGE=	709.96	1	852.0	00	1	154
7 020	164248	337	2.339	12.767	AZ/EL	RANGE=	688.10	1	858.0	00	1	155
7 020	164254	337	5.750	13.183	AZ/EL	RANGE=	668.35	1	864.0	00	1	156
7 020	164300	337	9.377	13.816	AZ/EL	RANGE=	650.96	1	870.0	00	1	157
7 020	164306	337	13.134	14.203	AZ/EL	RANGE=	636.09	1	876.0	00	1	158
7 020	164312	337	17.138	14.604	AZ/EL	RANGE=	623.90	1	882.0	00	1	159
7 020	164318	337	21.269	14.944	AZ/EL	RANGE=	614.58	1	888.0	00	1	160
7 020	164324	337	25.564	15.140	AZ/EL	RANGE=	608.28	1	894.0	00	1	161
7 020	164330	337	29.872	15.286	AZ/EL	RANGE=	605.03	1	900.0	00	1	162
7 020	164336	337	34.218	15.269	AZ/EL	RANGE=	604.94	1	906.0	00	1	163
7 020	164342	337	38.547	15.130	AZ/EL	RANGE=	607.96	1	912.0	00	1	164
7 020	164348	337	42.827	14.954	AZ/EL	RANGE=	614.10	1	918.0	00	1	165
7 020	164354	337	46.966	14.618	AZ/EL	RANGE=	623.23	1	924.0	00	1	166
7 020	164400	337	50.942	14.332	AZ/EL	RANGE=	635.24	1	930.0	00	1	167
7 020	164406	337	54.751	13.864	AZ/EL	RANGE=	649.96	1	936.0	00	1	168
7 020	164412	337	58.388	13.308	AZ/EL	RANGE=	667.26	1	942.0	00	1	169
7 020	164418	337	61.811	12.692	AZ/EL	RANGE=	686.83	1	948.0	00	1	170
7 020	164424	337	65.017	12.138	AZ/EL	RANGE=	708.58	1	954.0	00	1	171
7 020	164430	337	67.993	11.556	AZ/EL	RANGE=	732.30	1	960.0	00	1	172
7 020	164436	337	70.775	10.981	AZ/EL	RANGE=	757.73	1	966.0	00	1	173
7 020	164442	337	73.376	10.303	AZ/EL	RANGE=	784.80	1	972.0	00	1	174
7 020	164448	337	75.712	9.704	AZ/EL	RANGE=	813.29	1	978.0	00	1	175
7 020	164454	337	77.992	9.081	AZ/EL	RANGE=	843.09	1	984.0	00	1	176
7 020	164500	337	80.003	8.530	AZ/EL	RANGE=	874.03	1	990.0	00	1	177
7 020	164506	337	81.927	7.902	AZ/EL	RANGE=	906.00	1	996.0	00	1	178
7 020	164512	337	83.716	7.383	AZ/EL	RANGE=	938.90	1	1002.0	00	1	179
7 020	164518	337	85.302	6.878	AZ/EL	RANGE=	972.64	1	1008.0	00	1	180
7 020	164524	337	86.917	6.372	AZ/EL	RANGE=	1007.15	1	1014.0	00	1	181
7 020	164530	337	88.314	5.878	AZ/EL	RANGE=	1042.32	1	1020.0	00	1	182
7 020	164536	337	89.646	5.330	AZ/EL	RANGE=	1078.07	1	1026.0	00	1	183
7 020	164542	337	90.887	4.707	AZ/EL	RANGE=	1114.40	1	1032.0	00	1	184
7 020	164548	337	92.040	4.384	AZ/EL	RANGE=	1151.20	1	1038.0	00	1	185
7 020	164554	337	93.157	3.839	AZ/EL	RANGE=	1188.44	1	1044.0	00	1	186
7 020	164600	337	94.142	3.434	AZ/EL	RANGE=	1226.11	1	1050.0	00	1	187
7 020	164606	337	95.084	3.149	AZ/EL	RANGE=	1264.13	1	1056.0	00	1	188
7 020	164612	337	96.030	2.718	AZ/EL	RANGE=	1302.47	1	1062.0	00	1	189
7 020	164618	337	96.858	2.305	AZ/EL	RANGE=	1341.14	1	1068.0	00	1	190
7 020	164624	337	97.657	1.921	AZ/EL	RANGE=	1380.06	1	1074.0	00	1	191
7 020	164630	337	98.424	1.585	AZ/EL	RANGE=	1419.27	1	1080.0	00	1	192
7 020	164636	337	99.071	1.184	AZ/EL	RANGE=	1458.66	1	1086.0	00	1	193
7 020	164642	337	99.763	.814	AZ/EL	RANGE=	1498.29	1	1092.0	00	1	194

7 020 164648 337 100.449 .678 AZ/EL RANGE= 1538.13 1 1098.0 00 1 195

UNPACK COMPLETE.

SUMMARY OF DATA CHANGES MADE TO MASTER DATA TAPE

STATION	ADDED	DELETED
6	30	0
7	66	0
8	70	0

MASTER TAPE DATA SUMMARY.	STA	COUNT	HHMMSS, DAY	TO	HHMMSS, DAY	ELAPSED	HHMMSS, DAYS	TIMES IN SECONDS	ELAPSED		
	6	30	163000	337	163254	337	000254	0	90.0	264.0	174.0
	7	66	164018	337	164648	337	000630	0	708.0	1098.0	390.0
	8	70	163019	337	163713	337	000654	0	109.0	523.0	414.0

TDEP PROGRAM LINK 3 IS OPERATING.

SENSE SWITCH STATUS 1 DOWN, 2 UP, 3 DOWN, 4 UP, 5 DOWN, 6 UP,

START CLOCK 0712/40

\$\$-PLEASE NOTE--\$ THE ODP INPUT TAPE WILL BE REWOUND. AND REMADE COMPLETELY.

INTERMEDIATE TAPE=B=A4, IS COMPLETE.

ALL DATA FROM MASTER TAPE WILL BE PUT ON THE ODP INPUT TAPE

TDEP PROGRAM LINK 4 IS OPERATING.

SENSE SWITCH STATUS 1 DOWN, 2 UP, 3 DOWN, 4 UP, 5 DOWN, 6 UP,

START CLOCK 0712/50

REQUEST READ 000006027476

REQUEST READ 000006031302

EOF 000006031302

REQUEST READ 000007036516

REQUEST READ 000007040322

EOF 000007040322

REQUEST READ 000010043732

REQUEST READ 000010045536

EUF 000010045536

SUMMARY OF DATA TYPES ADDED TO ODP DATA TAPE IN 5 RECORDS

STATION	R	DR	EL	AZ	DEC	HA	C1	CC3	C3	D1	D3
6	30	0	30	30	0	0	0	0	0	0	0
7	66	0	66	66	0	0	0	0	0	0	0
8	70	0	70	70	0	0	0	0	0	0	0

THE ODP INPUT TAPE IS COMPLETE.

TDEP IS FINISHED. PUSH START TO RESTART TDEP. DEPRESS SIGN FIRST TO CALL ODP.

PLEASE CHECK KEYS AND PUSH START TO CALL ODP. INITIAL SETTING WAS 000000000000

ODP PROGRAM CALLED FROM TAPE B6.

2162, STANDARD ODP TAPE WITH MMP FEATURES, KINNEY STPREG, OCT15

INV COV MATRIX ESTIMATED PARAMETERS NOT N\*N.

TELETYPE TRACKING DATA EDITCR - TDEP - NOW OPERATING. KEYS=000000000000  
SENSE SWITCH STATUS 1 DOWN, 2 UP, 3 DOWN, 4 UP, 5 DOWN, 6 UP,  
TAPE STATUS A=B2, B=A4, C=A7, D=B7, INPUT=ONLINE OUTPUT = A3,  
CHANGE INJECTION 631200316,5139000

START CLOCK 0727/00

	CARD NUMBER	1	CHANGE TYPE CONTROL CARD
A NEW MASTER DATA TAPE WILL BE MADE USING TAPEC=A7, PLEASE PUSH START.			
CHANGE MISSION 53	CARD NUMBER	2	CHANGE TYPE CONTROL CARD
CHANGE TRANSMITTER ON AT 165140,337, STATION 1	CARD NUMBER	3	CHANGE TYPE CONTROL CARD
CHANGE TRANSMITTER ON AT 170706,337, STATION 4	CARD NUMBER	4	CHANGE TYPE CONTROL CARD
FREQ 1P1 81740 165140Z 337	CARD NUMBER	5	FREQ TYPE CONTROL CARD
FREQ 4P1 82220 170706Z 337	CARD NUMBER	6	FREQ TYPE CONTROL CARD
PASSID 12031 STATION 1	CARD NUMBER	7	PASSID TYPE CONTROL CARD
PASSID 12031 STATION 4	CARD NUMBER	8	PASSID TYPE CONTROL CARD
CHANGE DCI RESET 8 STATION 1	CARD NUMBER	9	CHANGE TYPE CONTROL CARD
SAMPLE TIME 5 STATION 1	CARD NUMBER	10	SAMPLE TYPE CONTROL CARD
COUNT TIME 5 STATION 1	CARD NUMBER	11	COUNT TYPE CONTROL CARD
CHANGE NO ANGLE CORRECTIONS	CARD NUMBER	12	CHANGE TYPE CONTROL CARD
REJECT C3 STATION 1,4	CARD NUMBER	13	REJECT TYPE CONTROL CARD
REJECT C1 STATION 1,4	CARD NUMBER	14	REJECT TYPE CONTROL CARD
REJECT ANGLES STATION 1	CARD NUMBER	15	REJECT TYPE CONTROL CARD
CHANGE INPUT BATCH STATION 1	CARD NUMBER	16	CHANGE TYPE CONTROL CARD
JETMTS 59 STARTING TRACKING DATA	CARD NO.	17	REJECTED - UNRECOGNIZABLE -
59 53 00 165228 299099 01205 01467571 337	CARD NO.	18	REJECTED - UNRECOGNIZABLE -
59 53 00 165243 301437 017218802063243 337	CARD NO.	26	REJECTED BLANK IN DECIMAL FIELD
59 53 00 165303 3072188027883 02951645 337	CARD NO.	29	REJECTED CHARACTER IN BLANK FIELD
CHANGE INPUT BATCH STATION 4	CARD NO.	33	REJECTED CHARACTER IN BLANK FIELD
41 53 8000 170706 089833 348768 0000000001 337	CARD NUMBER	79	CHANGE TYPE CONTROL CARD
TDEP PROGRAM LINK 2 IS OPERATING.	CARD NO.	80	REJECTED DP OUTSIDE NORM RANGE

SUMMARY OF THE 98 CARDS READ. 92 ACCEPTED, 6 REJECTED.( 2 UNRECOGNIZABLE, 3 FORMAT ERRORS, 1 DATA RANGE).

75 DATA CARDS ACCEPTED ARE UNPACKED BELOW. • INDICATES BAD DATA.

ID	DCC	G.M.T.	DAY	AZ/HA	EL/DEC	TYPE	DOPPLER/RANGE	DAT	SECONDS	D45	CNTR	CARD	
1	800	165153	337	.000	.000	AZ/EL	DOP=	177922	0	14.0	50	1	19
1	800	165158	337	.000	.000	AZ/EL	DOP=	356900	0	19.0	50	1	20
1	800	165203	337	.000	.000	AZ/EL	DOP=	537372	0	24.0	50	1	21
1	800	165208	337	.000	.000	AZ/EL	DOP=	719267	0	29.0	50	1	22
1	800	165213	337	.000	.000	AZ/EL	DOP=	902913	0	34.0	50	1	23
1	800	165218	337	.000	.000	AZ/EL	DOP=	1088599	0	39.0	50	1	24
1	800	165223	337	.000	.000	AZ/EL	DOP=	1276675	0	44.0	50	1	25
1	800	165233	337	.000	.000	AZ/EL	DOP=	1661822	0	54.0	50	1	27
1	800	165236	337	.000	.000	AZ/EL	DOP=	1860097	0	59.0	50	1	28
1	800	165248	337	.000	.000	AZ/EL	DOP=	2272345	0	69.0	50	1	30
1	800	165253	337	.000	.000	AZ/EL	DOP=	2488803	0	74.0	50	1	31
1	800	165258	337	.000	.000	AZ/EL	DOP=	2714440	0	79.0	50	1	32
1	800	165308	337	.000	.000	AZ/EL	DOP=	3203554	0	89.0	50	1	34
1	800	165313	337	.000	.000	AZ/EL	DOP=	3474262	0	94.0	50	1	35
1	800	165318	337	.000	.000	AZ/EL	DOP=	3769017	0	99.0	50	1	36
1	800	165323	337	.000	.000	AZ/EL	DOP=	4094299	0	104.0	50	1	37
1	800	165328	337	.000	.000	AZ/EL	DOP=	4457560	0	109.0	50	1	38
1	800	165333	337	.000	.000	AZ/EL	DOP=	4866376	0	114.0	50	1	39
1	800	165338	337	.000	.000	AZ/EL	DOP=	5326904	0	119.0	50	1	40
1	800	165343	337	.000	.000	AZ/EL	DOP=	5842102	0	124.0	50	1	41
1	800	165348	337	.000	.000	AZ/EL	DOP=	6410693	0	129.0	50	1	42
1	800	165353	337	.000	.000	AZ/EL	DOP=	7027613	0	134.0	50	1	43
1	800	165358	337	.000	.000	AZ/EL	DOP=	7685614	0	139.0	50	1	44
1	800	165403	337	.000	.000	AZ/EL	DOP=	8377000	0	144.0	50	1	45
1	800	165408	337	.000	.000	AZ/EL	DOP=	9094786	0	149.0	50	1	46
1	800	165413	337	.000	.000	AZ/EL	DOP=	9833174	0	154.0	50	1	47
1	800	165418	337	.000	.000	AZ/EL	DOP=	10587583	0	159.0	50	1	48
1	800	165423	337	.000	.000	AZ/EL	DOP=	11354487	0	164.0	50	1	49
1	800	165428	337	.000	.000	AZ/EL	DOP=	12131196	0	169.0	50	1	50

1	800	165433	337	.000	.000	AZ/EL	DOP=	12915661	0	174.0	50	1	51
1	800	165438	337	.000	.000	AZ/EL	DOP=	13706316	0	179.0	50	1	52
1	800	165443	337	.000	.000	AZ/EL	DOP=	14501952	0	184.0	50	1	53
1	800	165448	337	.000	.000	AZ/EL	DOP=	15301627	0	189.0	50	1	54
1	800	165453	337	.000	.000	AZ/EL	DOP=	16104604	0	194.0	50	1	55
1	800	165458	337	.000	.000	AZ/EL	DOP=	16910294	0	199.0	50	1	56
1	800	165503	337	.000	.000	AZ/EL	DOP=	17718227	0	204.0	50	1	57
1	800	165508	337	.000	.000	AZ/EL	DOP=	18520222	0	209.0	50	1	58
1	800	165513	337	.000	.000	AZ/EL	DOP=	19339368	0	214.0	50	1	59
1	800	165518	337	.000	.000	AZ/EL	DOP=	20152008	0	219.0	50	1	60
1	800	165523	337	.000	.000	AZ/EL	DOP=	20965729	0	224.0	50	1	61
1	800	165528	337	.000	.000	AZ/EL	DOP=	21780351	0	229.0	50	1	62
1	800	165533	337	.000	.000	AZ/EL	DOP=	22595724	0	234.0	50	1	63
1	800	165538	337	.000	.000	AZ/EL	DOP=	23411719	0	239.0	50	1	64
1	800	165543	337	.000	.000	AZ/EL	DOP=	24228227	0	244.0	50	1	65
1	800	165548	337	.000	.000	AZ/EL	DOP=	25045152	0	249.0	50	1	66
1	800	165553	337	.000	.000	AZ/EL	DOP=	25862413	0	254.0	50	1	67
1	800	165558	337	.000	.000	AZ/EL	DOP=	26679936	0	259.0	50	1	68
1	800	165603	337	.000	.000	AZ/EL	DOP=	27497664	0	264.0	50	1	69
1	800	165608	337	.000	.000	AZ/EL	DOP=	28315535	0	269.0	50	1	70
1	800	165613	337	.000	.000	AZ/EL	DOP=	29133504	0	274.0	50	1	71
1	800	165618	337	.000	.000	AZ/EL	DOP=	29951526	0	279.0	50	1	72
1	800	165623	337	.000	.000	AZ/EL	DOP=	30769563	0	284.0	50	1	73
1	800	165628	337	.000	.000	AZ/EL	DOP=	31587580	0	289.0	50	1	74
1	800	165633	337	.000	.000	AZ/EL	DOP=	32405546	0	294.0	50	1	75
1	800	165638	337	.000	.000	AZ/EL	DOP=	33223432	0	299.0	50	1	76
1	800	165643	337	.000	.000	AZ/EL	DOP=	34041213	0	304.0	50	1	77
1	800	165648	337	.000	.000	AZ/EL	DOP=	34858865	0	309.0	50	1	78
4	800	170806	337	85.414	348.264	HA/DEC	DOP=	6039430	0	987.0	50	1	81
4	800	170906	337	81.061	347.871	HA/DEC	DOP=	12280813	0	1047.0	50	1	82
4	800	170906	337	81.061	347.871	HA/DEC	DOP=	12280813	0	1047.0	50	1	83
4	800	171006	337	76.793	347.561	HA/DEC	DOP=	18714018	0	1107.0	50	1	84
4	800	171106	337	72.688	347.370	HA/DEC	DOP=	25326833	0	1167.0	50	1	85
4	800	171206	337	68.765	347.324	HA/DEC	DOP=	32105623	0	1227.0	50	1	86
4	800	171306	337	65.024	347.340	HA/DEC	DOP=	39035966	0	1287.0	50	1	87
4	800	171406	337	61.507	347.463	HA/DEC	DOP=	46103239	0	1347.0	50	1	88
4	800	171506	337	58.225	347.563	HA/DEC	DOP=	53293087	0	1407.0	50	1	89
4	800	171606	337	55.127	347.783	HA/DEC	DOP=	60591784	0	1467.0	50	1	90
4	800	171706	337	52.254	347.947	HA/DEC	DOP=	67986468	0	1527.0	50	1	91
4	800	171806	337	49.554	348.250	HA/DEC	DOP=	75465290	0	1587.0	50	1	92
4	800	171906	337	47.080	348.522	HA/DEC	DOP=	83017477	0	1647.0	50	1	93
4	800	172006	337	44.748	348.832	HA/DEC	DOP=	90633329	0	1707.0	50	1	94
4	800	172106	337	42.627	349.159	HA/DEC	DOP=	98304193	0	1767.0	50	1	95
4	800	172206	337	40.635	349.456	HA/DEC	DOP=	106022390	0	1827.0	50	1	96
4	800	172306	337	38.791	349.781	HA/DEC	DOP=	113781141	0	1887.0	50	1	97
4	800	172406	337	37.068	350.138	HA/DEC	DOP=	121574484	0	1947.0	50	1	98

INPUT DATA SUMMARY.	STA COUNT	HHMMSS, DAY TO	HHMMSS, DAY	ELAPSED	HHMMSS, DAYS	TIMES IN SECONDS	ELAPSED				
	1	165153	337	165648	337	000455	0	14.0	309.0	295.0	
	4	18	170806	337	172406	337	001600	0	987.0	1947.0	960.0

UNPACK COMPLETE.

STA ANGLES DOPPLER SUMMARY OF INPUT DATA REJECTED BY ACCEPT AND REJECT CONTROL CARDS.

1 114 0

DATA FOUND OUT OF TIME SORT. STA POINTS REMOVED

4 2

CORE SORT BY STATION COMPLETE.

CORE SORT BY TIME COMPLETE.

75 DATA CARDS ACCEPTED ARE UNPACKED BELOW. \* INDICATES BAD DATA.

ID	DCC	G.M.T.	DAY	AZ/HA	EL/DEC	TYPE	DOPPLER/RANGE	DAT	SECONDS	D45	CNTR	CARD	
1	800	165153	337	.000	.000	AZ/EL	DOP=	177922	0	14.0	50	1	19

1	800	165158	337	.000	.000	AZ/EL	DOP=	356990	0	19.0	50	1	20
1	800	165203	337	.000	.000	AZ/EL	DOP=	537372	0	24.0	50	1	21
1	800	165208	337	.000	.000	AZ/EL	DOP=	719267	0	29.0	50	1	22
1	800	165213	337	.000	.000	AZ/EL	DOP=	902913	0	34.0	50	1	23
1	800	165218	337	.000	.000	AZ/EL	DOP=	1088599	0	39.0	50	1	24
1	800	165223	337	.000	.000	AZ/EL	DOP=	1276675	0	44.0	50	1	25
1	800	165233	337	.000	.000	AZ/EL	DOP=	1661822	0	54.0	50	1	27
1	800	165238	337	.000	.000	AZ/EL	DOP=	1860097	0	59.0	50	1	28
1	800	165248	337	.000	.000	AZ/EL	DOP=	2272345	0	69.0	50	1	30
1	800	165253	337	.000	.000	AZ/EL	DOP=	2488803	0	74.0	50	1	31
1	800	165258	337	.000	.000	AZ/EL	DOP=	2714440	0	79.0	50	1	32
1	800	165308	337	.000	.000	AZ/EL	DOP=	3203554	0	89.0	50	1	34
1	800	165313	337	.000	.000	AZ/EL	DOP=	3474262	0	94.0	50	1	35
1	800	165318	337	.000	.000	AZ/EL	DOP=	3769017	0	99.0	50	1	36
1	800	165323	337	.000	.000	AZ/EL	DOP=	4094299	0	104.0	50	1	37
1	800	165328	337	.000	.000	AZ/EL	DOP=	4451560	0	109.0	50	1	38
1	800	165333	337	.000	.000	AZ/EL	DOP=	4866376	0	114.0	50	1	39
1	800	165338	337	.000	.000	AZ/EL	DOP=	5326904	0	119.0	50	1	40
1	800	165343	337	.000	.000	AZ/EL	DOP=	5842102	0	124.0	50	1	41
1	800	165348	337	.000	.000	AZ/EL	DOP=	6410693	0	129.0	50	1	42
1	800	165353	337	.000	.000	AZ/EL	DOP=	7027613	0	134.0	50	1	43
1	800	165358	337	.000	.000	AZ/EL	DOP=	7685614	0	139.0	50	1	44
1	800	165403	337	.000	.000	AZ/EL	DOP=	8377000	0	144.0	50	1	45
1	800	165408	337	.000	.000	AZ/EL	DOP=	9094786	0	149.0	50	1	46
1	800	165413	337	.000	.000	AZ/EL	DOP=	9833174	0	154.0	50	1	47
1	800	165418	337	.000	.000	AZ/EL	DOP=	10587583	0	159.0	50	1	48
1	800	165423	337	.000	.000	AZ/EL	DOP=	11354487	0	164.0	50	1	49
1	800	165428	337	.000	.000	AZ/EL	DOP=	12131196	0	169.0	50	1	50
1	800	165433	337	.000	.000	AZ/EL	DOP=	12915661	0	174.0	50	1	51
1	800	165438	337	.000	.000	AZ/EL	DOP=	13706316	0	179.0	50	1	52
1	800	165443	337	.000	.000	AZ/EL	DOP=	14501952	0	184.0	50	1	53
1	800	165448	337	.000	.000	AZ/EL	DOP=	15301627	0	189.0	50	1	54
1	800	165453	337	.000	.000	AZ/EL	DOP=	16104604	0	194.0	50	1	55
1	800	165458	337	.000	.000	AZ/EL	DOP=	16910294	0	199.0	50	1	56
1	800	165503	337	.000	.000	AZ/EL	DOP=	17718227	0	204.0	50	1	57
1	800	165508	337	.000	.000	AZ/EL	DOP=	18528022	0	209.0	50	1	58
1	800	165513	337	.000	.000	AZ/EL	DOP=	19339368	0	214.0	50	1	59
1	800	165518	337	.000	.000	AZ/EL	DOP=	20152008	0	219.0	50	1	60
1	800	165523	337	.000	.000	AZ/EL	DOP=	20965729	0	224.0	50	1	61
1	800	165528	337	.000	.000	AZ/EL	DOP=	21780351	0	229.0	50	1	62
1	800	165533	337	.000	.000	AZ/EL	DOP=	22595724	0	234.0	50	1	63
1	800	165538	337	.000	.000	AZ/EL	DOP=	23411719	0	239.0	50	1	64
1	800	165543	337	.000	.000	AZ/EL	DOP=	24228227	0	244.0	50	1	65
1	800	165548	337	.000	.000	AZ/EL	DOP=	25045152	0	249.0	50	1	66
1	800	165553	337	.000	.000	AZ/EL	DOP=	25862413	0	254.0	50	1	67
1	800	165558	337	.000	.000	AZ/EL	DOP=	26679938	0	259.0	50	1	68
1	800	165603	337	.000	.000	AZ/EL	DOP=	27497664	0	264.0	50	1	69
1	800	165608	337	.000	.000	AZ/EL	DOP=	28315535	0	269.0	50	1	70
1	800	165613	337	.000	.000	AZ/EL	DOP=	29133504	0	274.0	50	1	71
1	800	165618	337	.000	.000	AZ/EL	DOP=	29951526	0	279.0	50	1	72
1	800	165623	337	.000	.000	AZ/EL	DOP=	30769563	0	284.0	50	1	73
1	800	165628	337	.000	.000	AZ/EL	DOP=	31587580	0	289.0	50	1	74
1	800	165633	337	.000	.000	AZ/EL	DOP=	32405546	0	294.0	50	1	75
1	800	165638	337	.000	.000	AZ/EL	DOP=	33223432	0	299.0	50	1	76
1	800	165643	337	.000	.000	AZ/EL	DOP=	34041213	0	304.0	50	1	77
1	800	165648	337	.000	.000	AZ/EL	DOP=	34858865	0	309.0	50	1	78
4	800	170806	337	85.414	348.264	HA/DEC	DOP=	6039430	0	987.0	50	1	81
4	800	171006	337	76.793	347.561	HA/DEC	DOP=	18714018	0	1107.0	50	1	84
4	800	171106	337	72.688	347.370	HA/DEC	DOP=	25326833	0	1167.0	50	1	85
4	800	171206	337	68.765	347.324	HA/DEC	DOP=	32105623	0	1227.0	50	1	86
4	800	171306	337	65.024	347.340	HA/DEC	DOP=	39035966	0	1287.0	50	1	87
4	800	171406	337	61.507	347.463	HA/DEC	DOP=	46103239	0	1347.0	50	1	88
4	800	171506	337	58.225	347.563	HA/DEC	DOP=	53293087	0	1407.0	50	1	89
4	800	171606	337	55.127	347.783	HA/DEC	DOP=	60591784	0	1467.0	50	1	90
4	800	171706	337	52.254	347.947	HA/DEC	DOP=	67986468	0	1527.0	50	1	91

	STA	COUNT	HHMMSS, DAY	TO	HHMMSS, DAY	ELAPSED	HHMMSS, DAYS	TIMES IN SECONDS	ELAPSED
4	800	1718C6	337	49.554	348.250	HA/DEC DOP=	75465290	0	1587.0
4	800	171906	337	47.080	348.522	HA/DEC DOP=	83017477	0	1647.0
4	800	172006	337	44.748	348.832	HA/DEC DOP=	90633329	0	1707.0
4	800	172106	337	42.627	349.159	HA/DEC DOP=	98304193	0	1767.0
4	800	172206	337	40.635	349.456	HA/DEC DOP=	106022390	0	1827.0
4	800	172306	337	38.791	349.781	HA/DEC DOP=	113781141	0	1887.0
4	800	172406	337	37.068	350.138	HA/DEC DOP=	121574484	0	1947.0

INPUT DATA SUMMARY.	STA	COUNT	HHMMSS, DAY	TO	HHMMSS, DAY	ELAPSED	HHMMSS, DAYS	TIMES IN SECONDS	ELAPSED
	1	57	165153	337	165648	337	000455	0	14.0
	4	16	170806	337	172406	337	001600	0	987.0

UNPACK COMPLETE.

SUMMARY OF DATA CHANGES MADE TO MASTER DATA TAPE

STATION	ADDED	DELETED
1	57	0
4	16	0

MASTER TAPE DATA SUMMARY.	STA	COUNT	HHMMSS, DAY	TO	HHMMSS, DAY	ELAPSED	HHMMSS, DAYS	TIMES IN SECONDS	ELAPSED
	1	57	165153	337	165648	337	000455	0	14.0
	4	16	170806	337	172406	337	001600	0	987.0

TDEP PROGRAM LINK 3 IS OPERATING.

SENSE SWITCH STATUS 1 DOWN, 2 UP, 3 DOWN, 4 UP, 5 DOWN, 6 UP,

START CLOCK 0728/30

\$\$-PLEASE NOTE-\$\$. THE ODP INPUT TAPE WILL BE REWOUND. AND REMADE COMPLETELY.

INTERMEDIATE TAPE=A4, IS COMPLETE.

SUMMARY OF DATA NOT USED LISTED BELOW BY REASON. STATION= 1 2 3 4  
ANGLE PAIRS REJECTED BY ELEVATION ANGLE RESTRAINTS 0 0 0 1

TDEP PROGRAM LINK 4 IS OPERATING.

SENSE SWITCH STATUS 1 DOWN, 2 UP, 3 DOWN, 4 UP, 5 DOWN, 6 UP,

START CLOCK 0728/40

REQUEST READ 000001027476

REQUEST READ 000001031302

EOF 000001031302

REQUEST READ 00000404C322

REQUEST READ 000004042126

EOF 000004042126

SUMMARY OF DATA TYPES ADDED TO ODP DATA TAPE IN 2 RECORDS

STATION	R	DR	EL	AZ	DEC	HA	C1	CC3	C3	D1	D3
1	0	0	0	0	0	0	0	53	0	0	0
4	0	0	0	0	15	15	0	14	0	0	0

THE ODP INPUT TAPE IS COMPLETE.

TDEP IS FINISHED. PUSH START TO RESTART TDEP. DEPRESS SIGN FIRST TO CALL ODP.

PLEASE CHECK KEYS AND PUSH START TO CALL ODP. INITIAL SETTING WAS 000000000000  
ODP PROGRAM CALLED FROM TAPE B6.

2162, STANDARD ODP TAPE WITH MMP FEATURES, KINNEY STPREG, OCT15

INV COV MATRIX ESTIMATED PARAMETERS NOT N=N.

## APPENDIX G

### Sense Switch Settings

Sense Switch Down	Link 1	Link 2	Link 3	Link 4
1	Make new master tape when injection card is read	Not used	Not used	Call ODP Off B6, Up: Call ODP Off A9, Down
2	Stop at beginning of link to read binary corrections	Same as Link 1	Same as Link 1	Same as Link 1
3	Print control cards On-Line Up: Operational Mode*	Not used	Not used	Stop when Link 4 is finished
4	Make BCD list tape on Tape A if less than 100 cards are read	Not used	Average angles to compressed doppler times	Not used
5	Not used	Not used	Make a new ODP Input Tape	Not used
6	Print all output On-Line, as well as Off-Line	Same as Link 1	Same as Link 1	Same as Link 1

\*If SS3 is up, all sense switch settings will be ignored.

## APPENDIX H

### Blunder Rejection in the TDEP

#### I. INTRODUCTION

Elementary blunder rejection in the TDEP is performed in computation and examination of ordinary second differences on destructive doppler and angle data. The second difference tests remove most of the blunders introduced into the data by teletype errors and other mechanical failures. Since the TDEP has no access to information about the probe's trajectory, it is necessary that such tests not be particularly sensitive to rapid changes in the probe's trajectory; therefore the tests are designed to eliminate especially those observations which are difficult for the ODP to recognize as blunders, without either rejecting all data (in the early passes of a mission) or perhaps rejecting any data (in the later passes of a mission, when the ODP has the capability of doing so). In addition, certain control cards may be used to alter the rejection criteria when it seems desirable.

#### II. MATHEMATICAL DESCRIPTION

##### A. Definitions

- $X_i$  = observable *i*
- $\Delta_i$  =  $X_{i+1} - X_i$
- $\Delta_i^2$  =  $\Delta_i - \Delta_{i-1}$
- $t_i$  = time associated with  $X_i$
- $\bar{\Delta}^2$  = average value of  $\Delta_i^2$  over-all  $\Delta_i^2$  in sample
- $\delta(X)$  = maximum acceptable deviation from  $X_i$
- $\mu(X)$  = "bias" criterion for  $\Delta_i^2$

##### B. Computation

1. Number of observables = *k*

$$11 \leq k \leq 441$$

$$t_{i+1} - t_i = t_{i+2} - t_{i+1}, \quad i = 1, \dots, k-1$$

2. Form first difference table  $\Delta_i$ ,  $i = 1, \dots, k-1$

3. Form second difference table  $\Delta_i^2$ ,  $i = 1, \dots, k-1$

4. Form  $\bar{\Delta}^2 = \frac{1}{k-2} \sum_{i=2}^{k-1} \Delta_i^2$

5. Set  $i = 1$ , then  $\rightarrow$  6.

6. If  $\Delta_i^2 \leq \mu(X)$ , then  $\rightarrow$  8; otherwise  $\rightarrow$  7.
  7. If  $\bar{\Delta}^2 - \Delta_i^2 - \sigma(X) \leq 0$  reject  $X_i$ .
  8. Set  $i = i + 1$ . If  $i \leq k - 1$ , then  $\rightarrow$  6; otherwise  $\rightarrow$  9.
  9. If  $\Delta_{i-1}^2 + \Delta_{i+1}^2 \leq 0.05$ , accept  $X_{i-1}$  and  $X_{i+1}$  as good points if previously rejected  $\rightarrow$  10.
  10. Perform second difference tests on next sample  $\rightarrow$  1. If no new samples  $\rightarrow$  11.
  11. Repeat entire process with rejected observables removed.
- Nominal values for  $\mu_j(X)$ ,  $\sigma_j(X)$ , where  $j$  is station number.
- |        |                       |                     |
|--------|-----------------------|---------------------|
| D1BIA: | $\mu_j(DP) = 100.$    | $j = 1, 2, 3, 4, 5$ |
| D1DEV: | $\sigma_j(DP) = 100.$ | $j = 1, 2, 3, 4, 5$ |
| A1BIA: | $\mu_j(DEC) = 1.$     | $j = 2, 3, 4, 5$    |
|        | $\mu_j(EL) = 1.$      | $j = 1$             |
| A1DEV: | $\sigma_j(DEC) = 1.$  | $j = 2, 3, 4, 5$    |
|        | $\sigma_j(EL) = 1.$   | $j = 1$             |
| A2BIA: | $\mu_j(HA) = 1.$      | $j = 2, 3, 4, 5$    |
|        | $\mu_j(AZ) = 1.$      | $j = 1$             |
| A2DEV: | $\sigma_j(HA) = 1.$   | $j = 2, 3, 4, 5$    |
|        | $\sigma_j(AZ) = 1.$   | $j = 1$             |

## APPENDIX I

### Processing of Angle Pairs in Link 3

#### I. REJECTION OF ANGLE PAIRS BY ELEVATION ANGLE CONSTRAINTS

DSIF angle pairs are not transmitted to the ODP input tape when the observations fall outside constraints in the elevation angle. The minima and maxima assumed in the TDEP are:

	Internal station number	Minimum, deg	Maximum, deg
MTS(59)	1	5	85
JETGLD-2(11)	2	10	90
JETGLD-3(12)	3	5	85
WOOMERA(41)	4	10	90
JOBURG(51)	5	10	90

These constants can be changed by control card input.

For AZ-EL stations, direct comparison to EL determines the validity of the angles. For HA-DEC stations, the elevation angle must be derived from the angle pair. If one angle of the pair is missing, no check is possible. The approximation used in the TDEP is:

$$\sin(\text{EL}) = \cos(\text{HA}) \cos(\text{DEC}) \cos\Phi + \sin(\text{DEC}) \sin\Phi$$

where  $\Phi$  = geodetic latitude of the station

The values for  $\sin\Phi$  and  $\cos\Phi$  are tabulated in the program as:

Station	SinΦ	CosΦ
11 = 2	0.57913178	0.81523394
12 = 3	0.57913178	0.81523394
41 = 4	-0.52075428	0.85370661
51 = 5	-0.43660334	0.89966411

These constants cannot be changed except by program reassembly.

## II. ANGLE CORRECTIONS IN THE TDEP

Corrections to the angle pairs from stations 41 and 51 are normally made in the TDEP. These corrections are intended to reduce the errors in the angle observations due to inaccuracies in the antennas. Although the program is fully implemented to perform this function only for stations 41 and 51, coefficients for the correction polynomials may be input to the program via control cards for any other HA-DEC station.

The general form of the error equation is that of a  $2n^{\text{th}}$  degree, two-dimensional polynomial.

$$\delta(\text{HA}) = \sum_{i,j} A_{i,j}(\text{HA})^i(\text{DEC})^j, i, j = 0, \dots, n \quad (1)$$

and

$$\delta(\text{DEC}) = \sum_{i,j} B_{i,j}(\text{HA})^i(\text{DEC})^j, i, j = 0, \dots, n \quad (2)$$

where

$$\delta(\text{HA}) = (\text{HA})_A - (\text{HA})_{\text{EC}} \text{ and } \delta(\text{DEC}) = (\text{DEC})_A - (\text{DEC})_{\text{EC}}$$

HA is local hour angle, and DEC is declination. The subscript A indicates that the angle so identified is apparent or measured. The subscript EC means ephemeris-corrected and refers to the true angular coordinate of the star (determined from the star ephemeris) corrected for refraction.

Thus, if  $\delta(\text{HA})$  or  $\delta(\text{DEC})$  is to be applied to incoming angular data to remove the mean systematic error, it must be subtracted from the data so that

$$\text{corrected Hour Angle} = (\text{HA})_A - D(\text{HA}), \text{ and}$$

$$\text{corrected Declination} = (\text{DEC})_A - D(\text{DEC}).$$

Any other corrections, such as for refraction, must be made in the ODP.

The equations used in the TDEP are of 8th degree, that is,  $n = 4$ . The coefficients used in the program are:

### Station 41

$A_{00} = 8.0146025 \times 10^{-2}$	$B_{00} = 9.0860527 \times 10^{-2}$
$A_{01} = 5.45289422 \times 10^{-4}$	$B_{01} = 1.34214922 \times 10^{-4}$
$A_{02} = 2.48249580 \times 10^{-6}$	$B_{02} = 1.41108901 \times 10^{-5}$
$A_{03} = 2.24566914 \times 10^{-7}$	$B_{03} = 0.0$
$A_{10} = 6.4243077 \times 10^{-4}$	$B_{10} = -3.8345691 \times 10^{-4}$
$A_{11} = 8.69584098 \times 10^{-6}$	$B_{11} = 3.34771543 \times 10^{-6}$

**Station 41 (Cont'd)**

$A_{12} = -6.52074417 \times 10^{-7}$	$B_{12} = 1.01895206 \times 10^{-7}$
$A_{13} = -1.59490382 \times 10^{-8}$	$B_{13} = 0.0$
$A_{20} = -3.3956128 \times 10^{-7}$	$B_{20} = -8.5070846 \times 10^{-6}$
$A_{21} = -7.89511508 \times 10^{-8}$	$B_{21} = 4.53942058 \times 10^{-9}$
$A_{22} = -7.04116079 \times 10^{-9}$	$B_{22} = 2.09578021 \times 10^{-9}$
$A_{23} = -1.23595449 \times 10^{-10}$	$B_{23} = 0.0$
$A_{30} = -6.3636126 \times 10^{-8}$	$B_{30} = -5.5657391 \times 10^{-9}$
$A_{31} = 1.90513748 \times 10^{-9}$	$B_{31} = 0.0$
$A_{32} = 3.95248319 \times 10^{-10}$	$B_{32} = 0.0$
$A_{33} = 9.57751208 \times 10^{-12}$	$B_{33} = 0.0$

**Station 51**

$A_{00} = 2.7012702 \times 10^{-2}$	$B_{00} = 3.2645745 \times 10^{-3}$
$A_{01} = 1.58528433 \times 10^{-4}$	$B_{01} = 1.0443459 \times 10^{-4}$
$A_{02} = 6.24530962 \times 10^{-6}$	$B_{02} = -3.6495579 \times 10^{-6}$
$A_{03} = 3.43842729 \times 10^{-7}$	$B_{03} = 2.0183882 \times 10^{-7}$
$A_{10} = 4.1445643 \times 10^{-4}$	$B_{10} = -5.0429648 \times 10^{-5}$
$A_{11} = 9.3636995 \times 10^{-6}$	$B_{11} = 4.55037975 \times 10^{-6}$
$A_{12} = -3.41913978 \times 10^{-7}$	$B_{12} = -9.4572764 \times 10^{-8}$
$A_{13} = -3.76659061 \times 10^{-9}$	$B_{13} = -7.12650861 \times 10^{-9}$
$A_{20} = 4.5531603 \times 10^{-7}$	$B_{20} = -7.9892838 \times 10^{-6}$
$A_{21} = -1.03537453 \times 10^{-8}$	$B_{21} = 5.89778738 \times 10^{-8}$
$A_{22} = -3.04187273 \times 10^{-9}$	$B_{22} = 3.62801844 \times 10^{-9}$
$A_{23} = -1.52368379 \times 10^{-11}$	$B_{23} = -5.16572982 \times 10^{-11}$
$A_{30} = 1.3219781 \times 10^{-6}$	$B_{30} = -1.0465099 \times 10^{-8}$
$A_{31} = 6.22450846 \times 10^{-10}$	$B_{31} = 0.0$
$A_{32} = 1.79924034 \times 10^{-10}$	$B_{32} = 0.0$
$A_{33} = 3.31402952 \times 10^{-12}$	$B_{33} = 0.0$

## APPENDIX J

### Doppler Compression

Continuous doppler is compressed across a time interval, called a string. A string may be broken by one of the conditions below. When a string is broken, doppler points are differenced and divided by the time interval to form doppler rate.

1. Doppler not monotone increasing
2. Doppler missing at proper time point (or lost point)
3. Change in station sample rate
4. Time interval reaches the compression interval specified by control card
5. Change in compression interval specified by control card
6. End of doppler data
7. Core buffer empty
8. Change in station ground mode

As an example, the data stream below,

$X_1$	$X_2$	$X_3$	$X_4$	$X_5$	$X_6$	0	$X_8$	$X_9$	$X_{11}$	$X_{12}$	$X_{13}$	$X_{14}$
$t_1$	$t_2$	$t_3$	$t_4$	$t_5$	$t_6$	$t_7$	$t_8$	$t_9$	$t_{11}$	$t_{12}$	$t_{13}$	$t_{14}$

where  $X$  is doppler and  $t$  is time, might be compressed to

$$\begin{array}{llll}
 \frac{X_5 - X_1}{4\Delta t} & \frac{X_6 - X_5}{\Delta t} & \frac{X_9 - X_8}{\Delta t} & \frac{X_{14} - X_{11}}{3\Delta t} \\
 t_3 & t_5 + \frac{\Delta t}{2} & t_8 + \frac{\Delta t}{2} & t_{12} + \frac{\Delta t}{2}
 \end{array}$$

where  $4\Delta t$  is the count time specified by control card and  $t_{i+1} - t_i = \Delta t$ .